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A TEXT-BOOK

OF

Alkaloidal Therapeutics

BEING A CONDENSED RESUMÉ OF ALL AVAILABLE LITERATURE ON THE SUBJECT OF THE ACTIVE PRINCIPLES ADDED TO THE PERSONAL EXPERIENCE OF THE AUTHORS

BY

W. F. WAUGH, M.D., AND W. C. ABBOTT, M.D.

WITH THE COLLABORATION OF

E. M. EPSTEIN, M.D.

CHICAGO

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IS DEDICATED TO THOSE
WHO BELIEVE IN

"THE SMALLEST POSSIBLE
QUANTITY OF THE BEST
OBTAINABLE MEANS TO
PRODUCE A DESIRED
THERAPEUTIC RESULT."

86008

PREFACE

The authors of this book have long recognized the urgent necessity for a work upon Alkaloidal Therapeutics that should be as complete as the present knowledge of the subject will permit, hence this book. The physicians who practice Alkalometry, who have rejected the crudity and inexactness of the galenicals for the elegance, accuracy of dosage and activity of the active-principle remedies, are now counted by the tens of thousands, and their number is constantly increasing. And yet the "standard" text-books generally ignore this therapeutic movement and devote no more space to this important subject than did similar books two or three decades ago—in some cases even less.

The Alkaloidal idea is "in the saddle;" its phenomenal growth, in the face of active opposition and without the "weight of authority" to give it standing, is the strongest evidence of its vitality. Its enthusiastic advocates are creating for it a rich literature, but one which is scattered through many journals and books—American and European. Works of reference must be created to collect, supplement and "codify" this widening stream of material, in order to make it immediately available to the Alkaloidal student and practitioner. This is the mission of our book: to get together from all sources all the facts obtainable concerning the alkaloids and active principles, and to present them in a ready-to-use—truly "alkaloidal" —form. That many omissions have been made we are well aware—there are limitations to the perfection of all human work—but the work may be taken as it stands as a fair digest of the topics treated upon.

The student or physician who becomes interested in Alkaloidal therapeutics is sure to want in his library all the available literature upon the subject. We suggest that the following books be procured: Shaller's excellent "Guide to Alkaloidal Medication," Waugh's "Treatment of the Sick;" Abbott's "Alkaloidal Digest" and the three volumes of American Alkalometry now published (others to follow). In addition there is now in course of preparation an extended work upon Alkaloidal Practice which will be a companion volume to the Alkaloidal Therapeutics. The practician who is provided with

all these books—and studies them—will get renewed enthusiasm in his profession and more pleasure and profit in its practice.

In the preparation of this book we wish especially to acknowledge our obligations to Dr. E. M. Epstein for his painstaking research of the European literature of alkaloidal therapeutics. Nearly every page bears some impress of his able delving. We are also under a great debt to the thousands of members of the Clinic "family," who have aided us by their clinical experience and inspired us by their constant encouragement.

In treating of articles whose therapeutic uses have been developed largely or exclusively by the eclectics the authors have drawn liberally upon King's Dispensatory by Felter and Lloyd, and on Ellingwood. Many other writers have also been consulted, as will be seen.

Blank pages have been introduced throughout the book; we hope that our friends will use these to record their experiences with these remedies and that they will report their successes and failures, either directly to the authors or through the columns of *The Alkaloidal Clinic*.

THE AUTHORS.

Chicago, May 1, 1904.

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A TEXT-BOOK

OF

ALKALOIDAL THERAPEUTICS

ACONITINE.

Standard granules—Aconitine amorphous, alk., gr. 1-134, gm. .0005; aconitine amorphous, alk., gr. 1-500, gm. .000125; aconitine cryst. alk., gr. 1-500, gm. .000125.

Aconitine was discovered by Geiger and Hesse in 1833. It occurs in crystalline and in granular form. It is permanent in the air, odorless, the taste bitter at first, then sharp and tingling. When yellow it is impure and the taste is more burning. It is soluble in alcohol, ether, chloroform and hot water. It is absorbed from chloroform solution, or from wounds, ulcers or abrasions. For hypodermic use the nitrate is best, being quite soluble in water. The injections are very painful. Aconitine is found in Aconitum napellus, ferox, japonicum, and many other species, five of which are found in America.

Merck gives the formula as C_{33} H_{45} N O_{12}.

Duquesnel's method of extraction is as follows: 100 parts of powdered aconite root are mixed with one part of tartaric acid; this is exhausted by repeated percolation with cold alcohol, and the liquid evaporated at a low temperature on a water bath to the consistence of a fluid extract. To this is added distilled water, and the precipitated resinous and oily matter removed by filtration. The resultant solution of aconitine tartrate is then precipitated with a slight excess of potassium bicarbonate, agitated with washed ether and the two fluids separated with the siphon. The ethereal solution is shaken four or five times with a ten per cent solution of hydrochloric acid, which takes up the alkaloid from the ethereal solution. The acid liquids are treated with calcium carbonate to saturation, to prevent the acid injuring the aconitine; the mixture is evaporated at a very gentle heat, filtered, and while still warm mixed with a solution of sodium nitrate (2 of salt to 3 of water), having the same temperature. The whole is allowed to cool slowly during several

hours and set away for several days' rest, when the crystals separate out as a crust on the bottom.

Van Renterghem gives the following as the total daily dose of several aconitines:

Duquesnel's	gr. 1-20
Merck's crystallized	gr. 1-22—1-17
Merck's amorphous	gr. 1
Chanteaud's granules	gr. 5-6
Friedlaender's	gr. 15

Merck gives the following single dosage:

Aconitin (Eclectic resinoid) 0.003—0.005. Aconitine pure, crystal, 0.0001—0.00035; single maximum 0.0001, daily 0.003. Aconitine, pure amorph., 0.001. Aconitine from A. Ferox, 0.00026—0.00065.

The arsenate, hydrobromate, hydrochlorate, nitrate, phosphate, salicylate and sulphate are listed; doses same as of the alkaloid.

Physiologic and Toxic Actions.—1. The sensory nerve-ends are first stimulated, with tingling, warmth, sneezing, salivation, coughing, vomiting, neuralgic pain; later comes paralysis of tactile, pain and special sensation. The fifth cranial nerve is especially affected, the tongue, lips and cheeks; the other nerves in the order of their sensibility, those of the face, perineum, breast, belly and lastly the back.

2. The motor nerves are probably unaffected, as well as the muscles; the fibrillary twitching being possibly due to irritation of the intramuscular nerve-ends. The weakness may be attributed to the feeble circulation and innutrition. When applied directly, aconitine abolishes the irritability of all nerve-fiber.

3. The vasomotor medullary center is first stimulated and then depressed; the nerves and ends are unaffected. Arterial tension is lowered, the vessels containing less blood.

4. The mental faculties are not directly affected, but may become clouded by carbonic acid poisoning.

5. The vagus inhibitory center is strongly stimulated, slowing the heart and prolonging the diastole, the work done by each systole is notably increased, the auricles continue to beat after the ventricles have ceased, their rhythm becoming disassociated. In lethal doses the stimulation of the intracardiac inhibitory apparatus may exceed or outlast the stimulation of the center, and the heart beats rapidly and irregularly, passing into "cardiac delirium."

6. The respiratory center is directly depressed, breathing is slowed, expiration labored, the accessory muscles being called into prominent use; dyspnea occurs, the respirations become shallow, and death occurs by asphyxia. Convulsions may precede death.

7. The temperature falls, either from the normal or in fever. The fall is increased by cold, retarded by heat. This effect may be due in part to a direct effect upon the heat-regulating center.

8. The saliva is increased by direct irritation; the perspiration as a symptom of depression. Other secretions are increased doubtfully.

9. Oxidation is unaffected.

10. The pupil is first contracted, then dilated widely.

11. Aconitine is rapidly absorbed by the tissues, disappearing from the blood. It is excreted by the kidneys, traces appearing in the bile and saliva.

Atropine antagonizes the vagus inhibition and by sustaining respiration may save life when a lethal dose has been taken. But if the dose of aconitine be sufficiently large, death will still occur from heart-paralysis.

In physiologic doses aconitine relaxes and slows the pulse and respiration, lowers the temperature and the vascular tension, equalizing the circulation and dissipating hyperemia.

In toxic doses it causes tingling of the skin followed by anesthesia, salivation, slow labored respiration, the pulse slow and soft until imperceptible, with nausea and vomiting, and muscular debility, the symptoms of collapse supervening. Convulsions may occur, the pupils dilate and death ensues from asphyxia. The pulse may become irregular and rapid before death.

Locally, aconitine causes tingling of the tongue, throat, or any part to which it is applied. This is the diagnostic evidence of its presence.

Cash states that aconitine alters the cardiac rhythm, in certain large doses the ventricular systole having no corresponding auricular contraction. Ventricular delirium precedes death.

Benzaconine does not cause tingling or numbness; it slows the heart-beat astonishingly, but a ventricular systole often has two or three auricular contractions preceding it. This is the reverse of what obtains from aconitine. Absolute cardiac quiet for a time, shows interference with the cardiac motor impulses. Blood-pressure is reduced, but benzaconine is lethal through asphyxia. It scarcely affects the sensory nerves but depresses the motor, and checks muscu-

lar contraction. The temperature is not much depressed. Dose, 200 times that of aconitine, or 0.02.

Aconine causes neither numbness nor salivation. It strengthens the ventricular systole and antagonizes the incoördination of aconitine. In very large doses it depresses respiration and suspends the function of the motor nerves. Dose, 2000 times that of aconitine, or 0.2.

Toxicology.—The beginning of aconitine poisoning is denoted by the sensation of coolness at first, then horripilations in the back, heaviness of the limbs, tension and numbness of the face.

Taking fractional doses of the alkaloid, continued at intervals, we experience successively the following symptoms; numbness and tingling of the tongue, extending to the lips, less to the cheeks, the root of the nose, the forehead; oppression in the temples, light frontal headache; tingling in the hands, forearms and thighs, especially on the outer side; coolness and bristling in the back; the face is red; a sense of excitement like light alcoholic inebriety; appetite normal, often even more than usual.

Diuresis is a little increased, as well as the intestinal peristalsis, without influencing the stools.

The brain is unaffected, and the patient can work without difficulty.

The night following the day of experimentation is calm, sleep excellent, and on awaking all traces of aconitism have disappeared.

The pulse oscillates between 84 and 70, the temperature between 99.7° and 98.6° F.

Sphygmographic tracings give no result of value, the drug being taken within physiologic limits.

Van Renterghem found the minimum dose to produce a decided effect to be ¼ to ½ milligram of crystallized aconitine, or 10 to 15 milligrams of the amorphous; while the total dose for twelve hours was 3½ milligrams of the crystallized and 60 milligrams of the amorphous.

The effects of a lethal dose are thus described by Hookma Tresling: "A colleague had taken 3.6 milligrams of crystallized aconitine, substituted by the druggist for Friedlander's, a very weak preparation. The dose was taken at 4:30 p. m., just after a meal. At 5:30 the doctor found himself ill. He was pale, could hold himself erect with difficulty, mind clear; 8 p. m., pulse small, very irregular, normal rate; skin cool, pupils contracted. He complained of painful muscular contractions, especially of the mouth, burning

of the tongue and oppression in the abdomen, precordial anxiety, difficult deglutition, loss of taste, swelling of the tongue, great difficulty in moving or sustaining himself. Intense headache. Sensorium perfectly clear.

"Camphor, coffee and cognac were administered, also digitalis, with mustard to the extremities.

" 'Good God! How cold I am,' said he, repeatedly. In effect, the skin was like ice, especially the extremities.

"He cried, 'I can see no longer!' At that moment his pupils were dilated; they contracted, and his sight returned. The permanent disquiet was characteristic. He then vomited, first spitting up much mucus from the throat. Constantly he complained of the head and the epigastrium. At 8:40 he had the first convulsions, beginning with redness of the face and conjunctivæ, bright eye, then foam on the lips, then involuntary movements of the legs and face, breath stertorous and painful. The paroxysm was short. When over, he asked what had happened and spoke of buzzing in his ears, deafness, and heaviness of the head.

"Ether was then injected. He rolled up his own sleeve. The injection gave him pain. Immediately he cried again, 'How cold I am, I see nothing, colleague.' Pupils much dilated, repeated vomiting; second access of convulsions, more severe and prolonged than the first. He returned to himself but was exhausted. Seeing the girl who aided us weep, he said, 'Don't cry, I'll be better soon.'

"With difficulty I made him swallow some coffee and cognac. The pulse seemed less feeble. He said his head was on fire and he could not see. He uncovered his arm for an ether injection, and was solicitous about causing trouble.

"At 8:53 p. m., enormous vomiting occurred, cold sweat, the third series of convulsions closed the scene. After this he did not recover consciousness; the pupils were dilated, insensible to light; respiration light and difficult. Galvanism was applied without benefit. Respiration weakened, the pulse became imperceptible, the heart stopped, and he died at 9 p. m., four and one-half hours after taking the fatal dose."

There is no evidence that the stomach was washed out or atropine or strychnine administered.

In other cases the following additional symptoms were noted: Dicrotic pulse, eructations of gas, mental confusion, frontal and facial pains augmented by the least exercise of the brain, dyspnea, pollutions, vertigo, rarely somnolence.

From the foregoing description it will be readily understood that the picture of aconitine poisoning is a complicated one; if a sufficient dose has been taken the entire central and peripheral nervous system will be affected and in no well-defined manner. Thus one case will present one set of urgent symptoms and the next another. As it is not impossible for the practician to get a case of accidental poisoning from the chewing or swallowing in some manner of the root or other portions of the larkspur or monkshood plants, which are fairly common in gardens, he should remember that the most likely symptoms will be nausea, retching, with excessive salivation, burning of the mouth and fauces, and diarrhea. Next may appear muscular weakness, slow, weak heart, and the tingling and burning pass away as the stage of anesthesia begins. At this period there is apt to be great restlessness. Incoödination, vertigo, lividity and coldness of the surface, mark this stage—which is usually the second one though if any large amount of the poison has been taken it may be the first apparent. The ingestion of a still larger quantity usually means almost "sudden death," from failure of the heart-action, that organ being speedily paralyzed. In the ordinary case, however, death is more apt to come from respiratory than cardiac failure, and convulsions in this condition are not uncommon. Speech and the special senses may be affected, though intelligence usually remains unimpaired to the end. The drug has been used of late for suicidal purposes, but the symptoms are so unmistakable as a rule that it is not a favorite with criminals. The symptoms of aconitine poisoning may appear within five minutes and are seldom delayed more than half an hour. Heat is essential in the treatment, and the heart and respiration must be supported by heroic measures during the attempts at elimination, which should always be made.

Therapeutics.—The chief therapeutic indication for aconitine is the presence of hyperemia, or active congestion, the first stage of inflammation. The reason for the use of this agent lies in its power of reducing the heart-action, lessening the quantity of blood thrown into the arteries, and of relaxing the vasomotor spasm in the skin and elsewhere, allowing the blood to flow back into these channels and thus reducing the over-supply in the hyperemic area. It is therefore in the first stage of all inflammatory attacks that aconitine is to be administered, in small doses rapidly pushed until the full physiologic effects are manifested. The earlier the remedy is given, the more effective it will be. Pleurisy, pneumonia, bronchitis,

THERAPEUTIC NOTES

THERAPEUTIC NOTES

peritonitis and local inflammations everywhere, demand this treatment.

When consolidation has occurred in pneumonia, aconitine cannot be expected to dissipate the disease and cause the return of effused materials to the blood; but along the margin of the hepatized tract there is a zone of hyperemia, by which the affection gradually extends into the surrounding tissue. This is favorably influenced by aconitine, hence we find it useful through the stage of hepatization, as well as in moderating the heart-action when excessive and relieving the engorgement of blood in the unaffected portions of the lungs.

In specific fevers aconitine is most useful as a palliative, keeping the heart-action and fever from becoming excessive, moderating the symptoms though it may not affect the microbic causes.

The dose of Merck's amorphous aconitine, the best for use, is one to three milligrams, for an adult, repeated every ten to sixty minutes till the effect is evident, then as necessary to sustain the effect. It is always best to give aconitine in solution, to insure quick absorption. To children it may be given by Shaller's rule: One granule, gr. 1-134, for each year of the child's age, and one extra "for the glass," in twenty-four teaspoonfuls of water; the dose of this solution being one teaspoonful every ten to sixty minutes. For children under one year, the best plan is to divide the dose by the weight. A child at one year averaging 15 pounds, the dose for a year may be divided by the child's weight, so that a child weighing 7½ pounds, receives one-half the yearling's dose, regardless of the age.

In the vast field of febrile disease aconitine holds the first place as an antipyretic. As soon as the bowels have been emptied and rendered aseptic, aconitine should be administered in doses of one milligram (0.001) every ten to sixty minutes, until the fall of temperature, slowing of the pulse and other indications show that the full physiologic effect has been secured, after which the doses are repeated often enough to keep up the desired effect. The relaxation of arterial tension affords relief to the heart, removing one of the principal obstacles it has to overcome. Digitalin is frequently added to steady the heart, veratrine to stimulate the eliminant apparatus, and strychnine arsenate to increase vitality.

In sudden congestions from exposure to cold and wet, with consequent chills, headache, stoppage of menstruation, etc., the prompt use of aconitine will generally restore the circulatory equilibrium and bring back the flow, averting a serious illness.

In neuralgic maladies we have usually vasomotor spasm of the cutaneous capillaries, the skin pale, cool and shrunken, the pulse small and tense. Here also aconitine exerts a most prompt and favorable action, restoring the blood to the skin and relieving congested nerve centers.

In gastrointestinal maladies aconitine is of great value, subduing the local congestion and promoting resolution. In fact, to enumerate all the maladies in which aconitine is useful would be to list nearly all the maladies to which humanity is heir.

In all cases, it is necessary that the physician comprehend exactly the effect he desires, and that the doses be given, in frequency proportioned to the acuteness of the attack and the need for haste, until the desired effect is manifest. In general, a temperature fall to or below 102 should be secured and a pulse not over 90, before the remedy is to be given less frequently; but if the fever is evidently subdued, the patient sweating, pain relieved, pulse soft, the time for less frequent dosage has arrived. Few nurses fail to comprehend this simple direction: Give the medicine less frequently after the fever breaks; just enough to keep it down.

Amorphous aconitine has been used by many thousands of American physicians in the past seven years. One house has in that time sent out more than 20,000,000 granules of this alkaloid, and not a solitary case of fatality or of alarming toxic symptoms has been reported from its use. On the other hand the activity of these granules may be readily tested by allowing one to dissolve in the mouth, when the numbness appears promptly. In view of this statement, the superstitious dread with which this alkaloid has been regarded by many, may be safely laid aside.

Van Renterghem, speaking of synergists and antagonists, says: "In its excito-motor action aconitine acts in harmony with strychnine, brucine, caffeine and quinine; while in other respects it finds synergists in veratrine, colchicine and delphinine. It has no true antagonists." The secondary action of aconitine upon the cardiac functions may be opposed by curarine, or by atropine; which, paralyzing the inhibitory fibers of the pneumogastric, suppress the action of aconitine. These two agents are but partially antagonists (Laborde and Duquesnel).

Van Renterghem says that aconitine, by its sedative action on the vasomotor centers, slowing the pulse and the heartbeat, occupies the first rank among defervescents; while its power of reducing the caliber of the capillaries makes it the antiphlogistic *par*

excellence. By its use losses of blood can be stopped, while its anesthetic power over the nerves of sense gives it an honorable place as an antineuralgic. With strychnine and digitalin, Burggræve pronounces it invaluable as a preventive of fever and inflammation, in puerperal and surgical cases. He gives it in the evening, to prevent or moderate the physiologic evening rise, and insure rest. This he terms "equilibrating the physiologic balance." Van Renterghem finds aconitine of value in breaking up forming catarrhs and quinsies. With digitalin it is a powerful diuretic. With veratrine it combats fevers in the sthenic forms; it is combined with quinine in malaria, with digitalin for irregular hearts in acute maladies, with caffeine in somnolence and torpor, with strychnine to prevent depression and arouse vitality. It calms agitation, delirium, insomnia and nervousness. In alcoholic delirium it acts like magic when combined with digitalis, strychnine or hyoscyamine or morphine. In the deliriums met among the insane it is of like benefit. As an antineuralgic aconitine has marvelous success with hyperemic forms; not only in trigeminals but in neuropathies of central origin. It relieves toothache, even by inserting a granule in a carious cavity, alone or with one of hyoscyamine. In diathetic neuralgias the appropriate remedy must be given with the aconitine, such as quinine, arsenic, iodine, salicylates, etc. In chronic cases, catarrhal asthma, rheumatism, arthritic pains, old neuralgias, congestive amaurosis, associate it with iron, arsenic or zinc. It is efficacious in epilepsy and chorea (Burggræve). Visceral hyperemias call equally for aconitine (Laura). It cures tinnitus aurium.

Brunton enumerates among maladies in which aconitine is useful, pleurisy, pneumonia, phthisis, peritonitis, pericarditis, rheumatic fever, gout, erysipelas, otitis, gonorrhea and urethral fever; also the neuralgia accompanying herpes zoster, amenorrhea from a sudden check of the flow, and severe menorrhagia.

Butler says aconite seems to exert a peculiarly beneficial influence on acute mucous inflammations, with fever, small wiry pulse and rapid heart-action. He finds it most efficient in irritative fevers of children. Thrown into the rectum, it causes slight prolapse and quickly affects an irritable urethral stricture, facilitating catheterism. It has been recommended in cerebrospinal fever; and in aneurism as a sedative.

Murrell pronounces aconite invaluable in the initial stage of all acute fevers. In the eruptive fevers it brings out the rash and mitigates the subsequent severity.

pulse, temperature or respiration. In non-tubercular affections agaricin is almost always effective in checking profuse perspiration. Pure agaricic acid is soluble in oil of turpentine, and might be thus given with advantage in typhoid fever. It should be given in a single dose, five hours before the time for the expected perspiration. The patient soon becomes accustomed to agaricin and the dose must be increased. No bad effects have been recorded from its continued use. Atropine antagonizes agaricin, 0.01 (gr. 1-6) of agaricin fairly counteracting 0.0005 (gr. 1-134) of atropine (Proebsting).

Therapeutics.—Merrell recommends agaric in obstinate remittents, with brief chills and prolonged fever, little or no sweating, but jaundice, aching back and joints. Small doses should be given.

Kopp found it especially valuable in restraining the copious sweating of arthritics; and Grant claimed for agaric antirheumatic properties. The older writers seemed at sea as to the cathartic effect of agaric, numerous contradictory statements appearing in their pages. Gubler even contradicts himself; for while he attributes its anhidrotic effect to derivation by purgation, he says that this fungus has been wrongly ranked with the drastics, since doses of four grams may be given without purgative effects.

This is easily explained, as the purgative principle is the resin, while the anhidrotic power lies in agaricic acid.

Seyffert pronounced agaricin as efficacious as atropine against hectic sweats, and much less toxic.

Proebsting denied that four hours were necessary to develop the full effect of agaricin, which he found to act very promptly. Probably he employed a purer article.

Van Renterghem advises that agaricin be alternated with atropine or picrotoxin, to avoid the necessity of using large doses. Or, these agents may be given in combination.

Hofmeister gives the dose of pure agaricin as 0.004—0.02 (gr. 1-16—1-3).

Merck recommends agaricin in doses of 0.015—0.065 (gr. ¼—1), and pure agaricic acid preferably, 0.01—0.032 (gr. 1-6—1-2). He speaks favorably of its use for sweating from overdoses of the coaltar antipyretics.

Briefly, agaricin is anhidrotic, antiperiodic, a stimulant to the nervous system, and in large doses cathartic and emetic—the latter effects should never be produced with this drug. In some obscure aches of the back and limbs agaricin will give prompt relief.

THERAPEUTIC NOTES

THERAPEUTIC NOTES

ALETRIN.

Standard granule—Gr. 1-6, gm. 01.

Aletrin is a concentration from the rhizome of aletris farinosa.

This drug has been so generally confounded with helonias that the accounts of these two are worthless, and both must be restudied before their true place can be determined. Aletrin is a bitter tonic, devoid of tannic acid, and useful in atonic dyspepsias, vomiting of pregnancy, flatulence, borborygmi, wherever a mild nonirritant tonic is required. As to its use for dysmenorrhea and other affections of the female reproductive organs, it has a reputation that may be deserved.

The dose of aletrin may be placed at gr. 1-6 to 1-2 before meals. For dysmenorrhea give gr. 1-6 every fifteen minutes in hot water till relief.

ALNUIN.

Standard granule—Gr. 1-12, gm. .005.

Alnuin is a concentration from the bark of Alnus serrulata, the tag alder. The bark contains tannic acid, oils and a resin, the latter forming the bulk of alnuin.

King says that this agent powerfully increases retrograde metamorphosis, and is tonic to the mucosa, aiding digestion and assimilation. It is catalytic and antiputrefactive. It increases the flow of gastric juice. It is alterative, emetic and astringent.

The eclectics recommend alnuin in scrofula, glandular enlargements and suppurations, superficial diseases of the skin and mucosa as in eczema or pustular affections (Scudder), impetigo, herpes, prurigo, scurvy, scurf of the scalp in children, boils, passive hemorrhages, hematuria, purpura hemorrhagica, marasmus, mothers' sore mouth, indigestion and dyspepsia with deficient secretion of gastric juice and gastric motility, diarrheas attending the above gastric condition, leucorrhea, mammary indurations, hay fever (Ayer), gonorrhea and rhus poisoning. Where possible it should be employed locally as well as internally. The specific use is to improve nutrition and increase waste, in scrofula and scaly or pustular chronic skin diseases.

We have found this drug useful for women who are sallow and muddy except when menstruating. The use of alnuin clears up the complexion and renders it of a waxen brilliancy.

The dose is gr. ½ four times a day, increased if necessary till effect.

Dr. E. F. Bowers, of New York, gave alnuin with potassium iodide in a case of leg ulcer of 22 years' standing, with local antiseptics. A cure was secured in three months.

Dr. B. S. Horne considers alnuin superior to arsenic as a remedy for a bad complexion. In eczemas with feeble vitality he finds its effects surprising. Webster mentions a Thompsonian who relied almost wholly on alnus in all chronic affections and won phenomenal success. He claims for it a special affinity for the skin, influencing its nutrition. The reports point to the remedy as increasing cutaneous elimination of solids.

ALOIN.

Standard granules—Gr. 1-12, gm. .005; gr. 1-6, gm. .01.

Aloin is obtained from the Aloe spicata, Aloe socotrina and Aloe vulgaris (Nat. Ord. Liliaceæ). Hitherto the dried juice of the leaves was the preparation used in medicine. This consists of aloin, aloetin and aloetic resin, all cathartic, with a small proportion of gallic acid, fat and albumin, together with waste matter.

Aloin is obtained by evaporating an aqueous extract in vacuo. It occurs in small colorless crystals of sweetish bitter taste. It forms but a small proportion of aloes. It is inactive in the bowels while crystalline (Schmiedeberg).

Aloetin is an amorphous aloin, and is more active. It forms the bulk of the aloes.

Aloin dissolves freely in formamide, in 60 parts of cold water, 20 of alcohol, in hot water and hot glycerin, in the latter being transformed into aloetin. It belongs to the aromatics, since with caustic potash it splits up into paraoxy,—benzoic, acetic and oxalic acids.

Physiologic Action.—In doses of 0.01—0.06 (gr. 1-6—1) aloin increases the gastric secretion and motility (Liebreich).

Nothnagel denies that aloes requires bile to develop its cathartic activity, though he states that aloes and oxgall, or aloin and glycerin (Kohlstock), injected into the rectum, act as a cathartic. Nor does he admit the stomachic and digestive powers credited to aloes. But in these respects Liebreich differs with him.

In doses of 0.1—0.5 (gr. 1½—7½) aloes causes eructations, gastric oppression, and in about twelve hours several dark, mushy

stools, usually with some griping. Three times this dose does not cause catharsis more quickly, but more griping and rectal tenesmus, and the stools are more fluid. Aloes stimulates peristalsis strongly, especially in the lower bowel, and probably increases the excretion of bile, by a similar action on the walls of the gall-ducts. The continued use of aloes does not beget tolerance, but the contrary; so that when given continuously the dose may be gradually reduced, the same effect being manifested.

Aloes induces an afflux of blood to the rectum, uterus and ovaries, inducing or aggravating an existing tendency to hemorrhoids, hemorrhage from the rectum or uterus, abortion or strangury, and it strongly stimulates the sexual appetite and functions. It is therefore contraindicated in hemorrhoids, pregnancy, menstruation, erotism, tendency to menorrhagia, dysentery, nephritis, cystitis, and all pelvic engorgements. However, this does not apply to hemorrhoids with atony of the rectal sphincter and prolapse, in which minute doses of aloes are especially useful.

Aloin is actively cathartic in doses of 0.1—0.2 (gr. 1½—3), whether administered by the stomach, the rectum or subcutaneously, though it is milder when given hypodermically. It is then excreted into the bowel, acting locally there (Cushny). In large doses it is violently and painfully cathartic. It enters the blood, as the milk of a nurse taking aloin acts on her nursling's bowels.

Aloin differs as it is derived from the various forms of aloes brought to the market, the Socotrine, Cape, Barbadoes or hepatic; the former being probably the best. It occurs in small, bright, sulphur-yellow, prismatic needles, containing ½ an equivalent of water.

Therapeutics.—Aloes possesses the unique property of gradually increasing the tonicity and irritability of the muscular elements of the larger bowel. Given in doses of 0.005—0.06 (gr. 1-12—1) three times a day, or 0.001 (gr. 1-67) every hour until the bowels move, it will be found that the dose found sufficient to produce a daily action can be gradually diminished, until at length the drug can be altogether discontinued. The powerful influence of habit should be secured, the patient being enjoined to go to the closet at the same hour every day. The tendency to griping may be lessened by adding a minute dose of atropine, while the peristaltic action is enhanced by strychnine, the irritability by capsicum. The following granule has proved very popular:

Aloetin ..... gr. 1-67
Strychnine sulphate ..... gr. 1-134
Atropine sulphate ..... gr. 1-5000
Capsicum oleoresin ..... gr. 1-67

M. S. One every hour till the bowels move; or three to six before each meal.

These may be depended upon to cure any case of chronic constipation not dependent upon mechanical obstruction.

Aloes is emphatically a remedy for small doses, frequently administered. There is no legitimate use of this drug that requires a dose larger than one grain.

When hemorrhoids of long standing cease to bleed and symptoms of cerebral hyperemia appear, aloes will give relief by restoring the hemorrhoidal flux.

Aloes is sometimes employed as an emmenagogue in constipated, anemic women of frigid type, with scanty flow. It is also added in minute doses when iron or other constipating drugs are administered.

The griping caused by aloes is much lessened by giving it after meals. Cushny suggests that the bile may aid the action of purgatives by rendering them soluble, or by delaying the solution until they reach the lower bowel.

King says that aloin purges if it is applied to the surface of an ulcer or blister. Kohlstock found the solution in glycerin or in formamide relieved mild constipation when applied to the rectum, in doses of gr. vj to vijss. But this degree of effect would result from the glycerin alone.

For ascarides the aloetic solution should be injected past the sigmoid flexure into the colon, as these parasites flourish near the ileocecal valve.

In chlorosis, iron should be combined with the aloin; in hysteria add asafetida; in amenorrhea give four days before the time for the menses, with iron and myrrh; for acholic stools add podophyllin or calomel; while for melancholy, hypochondria, and the group of symptoms usually attendant, give with intestinal antiseptics, and see to the condition of the prostatic urethra. For chronic atonic diarrheas give the smallest doses, gr. 1-12 or less, with sulphur and atropine, also in small doses.

When costiveness is the cause of the constipation, aloes can do nothing but harm. It seems to have little or no good effect on flatulence, which is a surprise. But the addition of quassin and charcoal makes an effective combination.

ANEMONIN.

Standard granule—Anemonin, true, gr. 1-134, gm. .0005.

Anemonin is the active principle of Anemone pulsatilla and A. pratense. Unless the plants are collected soon after flowering the product is not very active.

Anemonin was discovered by Heyer in 1779.

Van Renterghem gives the following process for isolating anemonin: Prepare a very concentrated infusion of anemone in distilled water, and leave to itself for many weeks. It deposits a white substance, that is to be purified by crystallizations in alcohol. This gives an anemonin, white, crystalline, neutral, non-volatile but evaporating at 150 degrees.

Anemonin crystallizes in rhombic crystals and needles, heavier than water. There is little taste to it at first, but a burning later, this lasting some days. Volatilized by heat, the vapor causes a violent, piercing sensation on the tongue, leaving where it touches numb, white spots. The eyes and nose are irritated. It decomposes in air, and in drying. It is found in many species of anemone (ranunculus). It is obtained by distillation with water vapor. It is insoluble in cold water, sparingly soluble in boiling water and in ether, more in cold alcohol, easily in hot alcohol, and in chloroform. It dissolves readily in alkalies, passing into anemonic acid.

Physiologic Action.—Brunton says anemonin may cause local inflammation and gangrene when given subcutaneously, vomiting and purging when given by the stomach. It depresses the circulation, respiration and spinal cord, somewhat resembling aconitine. The symptoms are slow, weak pulse, slow respiration, coldness, paralysis beginning with the legs and extending to the arms, dyspnea, and death without convulsions. Poisoning by pulsatilla is always attended with convulsions, their absence being due to the paralysis by anemonin of the cerebral motor centers, and the possible presence in the herb of another convulsant principle.

Van Renterghem found that it required doses of 0.01 every hour for fifteen hours to produce cognizable effects. These were light prodromes of dyspepsia, anorexia, the sensation of a foreign body in the œsophagus that could not be passed on to the stomach; all disappearing by the following morning. The stools were normal, one or two daily, the subject being usually constipated. A single dose of 0.05 produced similar effects. He concludes that in these doses anemonin is not irritant to the stomach or bowels.

Ellingwood states that pulsatilla in toxic doses produces mental hebetude, dilated pupils, coma; it lowers the pulse, vascular tension and heart-force, and causes convulsions. It depresses sensation and motion. In small doses it stimulates the cerebral functions and tones the sympathetic, increases cardiac power, slowing the rapid weak pulse of nervous prostration.

Therapeutics.—Anemonin has been given in amenorrhea, dysmenorrhea, bronchitis, and other catarrhs, and in asthma (Brunton).

Borchain recommends it in acute epididymitis. Shapter found it useful in hysteric convulsions, and in reflex uterine spasms.

Phillips speaks of it as useful in mental disorders, and in sudden suppression of the menstrual or the lochial flow.

Bovet considers it a decided sedative in dysmenorrhea.

Ellingwood gives as specific indications for this agent, amenorrhea with mental perturbation and apprehension; spermatorrhea with fear; when genital maladies cause great anxiety. The homeopathists appear to give it whenever the patient is in apprehension of coming disaster. Anemonin gives strength and tone to the reproductive organs, regulating their actions, in the absence of acute hyperemia or inflammation. When this mental state is present during pregnancy, with general lack of tone, anemonin is beneficial; also in nervous exhaustion, nervous headache; the constipation, enuresis and dysuria of hysteria and pregnancy; urinary irregularities of pregnancy with ammoniacal urine, pain, tenesmus, catarrh, burning or shooting pains; in leucorrhea with pain in the loins, debility, depression, anorexia and general nervousness; in eruptive fevers, especially measles with excessive mucous irritation.

Scudder gives as specific indications for this remedy: Patient nervous and depressed, cries easily, pulse small and frequent, but soft; extremities cold; menses tardy and scant; patient then uneasy and depressed, with fullness and weakness in hips and back. It stimulates the mind and automatic ganglia. Heart symptoms due to apprehension give way to pulsatilla. It relieves the nervous symptoms of the menopause, especially with feeble nutrition.

Webster credits pulsatilla with a favorable influence over diseased synovial membranes; in crural phlebitis, varicocele, ophthalmia, earache of children (applied locally), "black eye," purpura, tinnitus aurium.

Merrell adds to these indications that of gastric distress after rich, greasy food; gastrointestinal catarrhs, wandering rheumatic pains, urticaria and styes.

THERAPEUTIC NOTES

THERAPEUTIC NOTES

As the active agents in pulsatilla are volatile, it is not surprising that preparations made from the dried plant should have proved "inert."

Van Renterghem lists the following affections as benefited by anemonin: Corneal leucoma and albugo, retinal anesthesia, commencing cataract, amblyopia, amaurosis, especially in arthritics or with functional abdominal disorders, where anemonin may be given alone or with strychnine; commencing atrophy of the optic nerve. In these ocular affections anemonin may be used locally and internally. Paraplegias relieved by anemonin by Seidler and others, were probably peripheric and diathetic. Clarus reported good results in bronchitis, influenza and whooping-cough, rebellious and irritant cough. Storck advised it to allay inveterate rheumatismal pains; and Von Schroff in chronic exanthems, serpiginous and syphilitic ulcers, found it useful.

Merck gives the dose of anemonin as 0.015—0.05 (gr. ¼ to ¾), twice daily; maximum daily dose 0.2 (gr. 3).

Van Renterghem advised doses of 0.001—0.01 every hour.

APIOL.

Standard granule—Apiol, true, gr. 1-67, gm. .001.

The interest in apiol dates from the appearance of Bartholow's book, in which he stated that this substance was an effective emmenagog, which was also safe in case of pregnancy, as it did not cause abortion. It is a remarkable thing, that apiol should discriminate between the pregnant and the non-pregnant female, and give the latter needed and desirable relief, while with adamantine virtue it resisted the beseechings of the unwise damsel and refused the still more ardently desired comfort.

Is it true? For my part I confess that I have never tried it. In these days the evidences of pregnancy are so complete, so easy to elicit, that there is no excuse for a mistake in diagnosis—at least in all the cases that have come under my care it was possible. And if circumstances arise that render the diagnosis uncertain, there is always the resource of delay till time settles this question.

And this seems to be the position occupied by the profession, for in all the years since Bartholow wrote I have never seen any report on this interesting question, and I am still at a loss as to its solution.

This is the result of an extended quest through the medical

literature on the subject of apiol, the results of which are herewith presented.

There is, however, without question a very general belief among practicians, that any active preparation containing apiol is really a dependable remedy in amenorrhea. The marked success of several proprietary articles of this nature must be due to effects obtained from this agent. And clinical experience has proved that apiol has marked emmenagog effects. The effective dose is very large, but even when given during early pregnancy, either by error of diagnosis or with criminal intent, apiol has failed entirely, I have been informed, in emptying the uterus of its undesirable contents. In all cases of menstrual suppression not due to pregnancy, apiol alone or combined with aloin and savine, has proved decidedly effective.

Green apiol is an oily liquid obtained from the garden parsley, Petroselinum sativum, the yield varying from 1 to 3 per cent. It is also found in celery and in Apium graveolens. It is soluble in alcohol and ether; is of a strong odor and sharp, disagreeable taste.

White apiol or "parsley camphor" is a stearoptene, soluble in alcohol, ether and oils. It occurs in long needle crystals of a faint parsley odor. It has been given in malaria and amenorrhea.

Physiologic Action.—In doses of gr. 7½ to 15 green apiol produces sensations similar to those of coffee; a sense of strength and euphoria, and warmth in the stomach. Doses of gr. 30 to 60 cause toxic symptoms, fever, headache, digestive disturbances, vertigo, ringing in the ears, deafness, scintillations, heavy frontal aching, the symptoms resembling those of overdoses of quinine. Apiol is strongly diuretic. In doses of gr. 9 to 12 it causes dicrotic pulse and disorders the rhythm of the heart.

Merck gives the dose of his product as m. 5 to 10 of the green, or for malaria m. 15 to 30; while the dose of the white is gr. 5 three times a day, or up to a dram daily as a maximum.

Shoemaker says parsley is carminative, diuretic, emmenagog, slightly laxative, stimulating the skin, circulation and bronchial mucous membrane. It contains apiolin, apiin and cariol.

Cariol causes genital hyperemia, increases the urine, general tremors or slight convulsions, paresis or motor incoördination, and finally death by asphyxia. In experiments on animals the dorso-lumbar cord was much congested, and the uterine vessels engorged.

Apiol acts like cariol on the nervous and circulatory systems, causing a rapid rise of arterial pressure, due to increase of the heart-

action and stimulation of the vasomotor centers in the medulla. Both increase the muscular excitability. Apiol congests the uterus and ovaries, and increases the mucous flow. Both are useful in spinal atony.

Apiolin in toxic doses causes somnolence, stupor, paresis, motor incoödination, increased respiration and circulation, and death by asphyxia. Small doses act on the unstriped muscular fiber, especially of the uterus, in pigs causing abortion.

Therapeutics.—Apiol has been used as a diuretic in dropsies, strangury and gonorrhea. It is not equal to quinine in agues. It is used for amenorrhea and dysmenorrhea. It is best suited for the amenorrhea of anemia; and if this is marked, iron may be added with advantage.

King recommends apiol in scarlatinal dropsy, retention of urine and as a local application for the stings and bites of insects, bruises, enlarged glands and swollen breasts. It dries up the milk. He also recommends it for fetid menstruation, neuralgic dysmenorrhea and uterine colic, and for the night-sweats of phthisis.

Homolle and Joret gave apiol in 43 cases of ague, curing 21 cases with one dose, 11 with two doses, 4 with three, 1 with seven, and failing in six cases. Homolle also found apiol useful in neuralgias, dysmenorrhea and amenorrhea.

The apiol of commerce is a mixture of the active principles, of which apiolin is perhaps the most effective. This comes to us from France elegantly prepared in capsules.

I have given apiol and apiolin for amenorrhea and found it effective. In fact, I look upon it as one of the most satisfactory emmenagogs in use, and one singularly free from unpleasant or objectionable qualities. Neither distress nor hemorrhage has ever followed its administration in my hands. I doubt the limitation to anemic cases, and several times have prescribed it for fat, plethoric women, who had every month great difficulty in getting the flow started, and without help would have none, but very marked fullness in the head, and headache, tinnitus, etc. In every case of this description apiol, in doses of five minims three times a day, in capsules, succeeded in inducing the flow within three days, when given at the menstrual period. In one case of this character apiol succeeded after the strongly purgative emmenagog tablets had failed though purging to the production of hemorrhoids.

In the anemic cases for which apiol is recommended by some authorities, it is not wise to give anything to incite the flow, until

by the use of iron, and proper hygiene, and laxatives usually, the patient has been raised to such affluence of blood as to enable her to spare what is required for the monthly loss. Sometimes amenorrhea is a warning from the body that the expenditure is not warranted; though women usually look upon the cessation of the flow as the cause of the ailments that really are the reasons for the discontinuance. The physician should take time to patiently explain this, as serious harm may result from unwise efforts to compel the flow from an exhausted body.

APOCYNIN.

Standard granule—Gr. 1-12, gm. .005.

Apocynin is the active principle of the American hemp, Apocynum cannabinum. From another of the Apocyneae, Aescanthera ouabaio, is derived ouabaine, the arrow poison of the Somalis. Apocynin belongs to the digitalis group, possessing their diuretic properties, but differs somewhat in its action on the heart.

This, the only really useful, active principle of Apocynum cannabinum (Nat. Ord. Apocynaceae) is obtained from the root of the plant. The popular names of Apocynum are Black Indian Hemp, and Dogsbane. Besides apocynin, a glycoid, apocynein, soluble in water, has been extracted; but the latter is little used therapeutically. The Eclectics have pushed this remedy to the front and consider it one of the most useful drugs in their list.

Therapeutics.—The information we can glean from the standard works upon therapeutics of apocynin is not startling in its richness.

Shoemaker says apocynum is emeto-cathartic from its apocynein, diuretic from its apocynin. The former is soluble in water, hence the irritating qualities of the decoction. Apocynin is soluble in alcohol, ether and chloroform, but not in water.

Richmond found the plant useful in jaundice and as an expectorant. Glinski found it relieved the functional disturbances attending organic heart-disease and lessened the area of dullness in cardiac dilatation.

Hare advises that if good results do not follow the use of the drug, another sample should be tried; but if you ask him why he doesn't use the active principle and avoid such uncertainty, what will he say? He states that the effects of apocynum in causing profuse diuresis, in cardiac and renal dropsy, have won for this drug the name of the "vegetable trocar."

Murray mentions as the only unpleasant effect, throbbing of the cerebral vessels.

We turn to the Eclectics and there find much more extended and precise data.

King says full doses cause vomiting, purging, sweating and diuresis, preceded by somnolence. As a diaphoretic it is of value in malarial fevers and pneumonias.

The decoction is useful in irritation and congestion of the uterus, with nausea, vomiting, tympanites, headache and aortic pulsation. The leading indication is dropsy with debility or struma, but no albuminuria, when it is to be given in small doses to remove the œdema but not as a purge. It acts by restoring cardiac force. If the dropsy is due to organic disease of the heart, liver or kidneys, apocynin will not relieve, but mitigates the affection. Nor is it indicated in fever, nor when the pulse is full and hard. Atony is the specific indication, with escape of the blood-serum into the tissues, which become water-soaked. Anemia is also present. It has been used with benefit in acute and chronic hydrocephalus, malarial and scarlatinal dropsies.

Another action of importance is in amenorrhea, passive menorrhagia, and leucorrhea, the uterus large and flabby, its tone relaxed. Œdema may coexist elsewhere.

In young girls where the menstrual flow is too free, comes too often and lasts too long, apocynum is effective. Old scrofulous and syphilitic cases are benefited, which indicates a depurative action. In atonic dyspepsias it removes constipation and fluid accumulations. Rheumatism is benefited by apocynum only if œdema is present or the parts are puffy or glistening.

As a heart-tonic, it is useful in dilation of the ventricles but not when the pulse is hard or quick.

One case was reported in which apocynum benefited an angina with œdema. The precordial oppression caused by tobacco was also relieved by this drug. It is most valuable in renal congestion, the second stage of desquamative nephritis. Goss affirmed that it was a remedy for ascarides.

Webster says that it is a specific for oft-recurring catarrhal attacks limited to the larynx, pharynx and post-nasal region. He speaks also of its use in cases of agonizing pain in the hip or groin, attributed to sciatica, where it gave prompt relief when morphine failed. The same writer values it in the dyspepsias of diabetes insipidus.

Ellingwood says apocynum increases the nervous force and the respiration, as well as the oxidation of the blood. It causes diuresis even when the heart is not affected. It does not irritate the kidneys, but overdoses have occasioned suppression of urine—probably by shutting off the renal arteries. It is of use in acute nephritis but the inflammation calls for other remedies to be added. He adds iron for anemics. Apocynin controls passive hemorrhages.

The desirable effects of the American hemp are due to the neutral principle apocynin, and a distinct gain is obtained by excluding the irritant emeto-cathartic apocynein. The former has proved a highly reliable diuretic and heart-tonic, closely resembling digitalin in these respects, but differing in that the hemp derivative acts on the liver also, and increases the solid output from this organ and the kidneys.

The limitation of its use to cases with low vascular tension should be heeded. The best dosage appears to be gr. 1-12 every two hours except when asleep, gradually increased to four times this dose, or until a satisfactory state of vascular tension has been secured. The occurrence of nausea or purging is an indication to moderate the dose.

Failure will surely occur if the drug is given when the indications are not present; hence apocynin is assuredly not "a remedy for dropsy" in all forms and conditions.

APOMORPHINE.

Standard granule—Gr. 1-67, gm. .001.

Apomorphine is a white powder obtained by heating morphine and concentrated hydrochloric acid at 301° F. One molecule of water is lost. Exposed to air or in water apomorphine becomes apple-green, without, however, affecting its physiologic action. This differs from that of morphine mainly in the loss of the latter's depressant effects, and the concentration of the stimulant action on the vomiting center. It is not excreted into the stomach like morphine, and may be decomposed in the body.

Physiologic Action.—Given hypodermically, in doses of 0.006 (gr. 1-10), apomorphine causes vomiting within ten minutes, the nausea quickly ceasing unless larger doses have been given. It also stimulates the secretion of saliva, respiratory mucus, tears, and sweat. Pulse and respiration become rapid, and the patient complains of depression and debility. If larger doses than necessary are given, the symptoms reach the degree of collapse, especially in children.

THERAPEUTIC NOTES

THERAPEUTIC NOTES

If given by the mouth in similar doses, according to Murrell, apomorphine does not even cause nausea, but powerfully stimulates the secretion of the respiratory mucous membrane. Rossbach states that non-emetic doses promote the excretion of mucus and make it more fluid. Cushny claims that this is simply the beginning of the action that leads to vomiting.

Vomiting is due to the action of the drug on the medullary center, not to gastric irritation. If apomorphine be directly applied to the medulla, vomiting occurs at once. Batelli found the stomach passive during vomiting from apomorphine. Schultz found it undergoing peristalsis towards the cardiac orifice.

Locally, apomorphine solution anesthetizes the cornea, causing dimness of vision. As with morphine, a feeling of well-being—euphoria—lassitude or somnolence, may follow the primary effect of apomorphine, whether emetic or expectorant.

Toxic doses paralyze the emetic center and narcosis ensues, with abolition of reflexes and dilatation of the pupil.

The centers of voluntary motion are excited strongly, then depressed. The respiratory centers are violently agitated but not depressed subsequently. The emetic center is excited by small doses, depressed by larger ones. The peripheral nerves, motor and sensory, are not depressed. The cardiac accelerator nerves are excited, the blood-pressure being unaffected. It is uncertain if the striated and cardiac muscular fibers are depressed in man as they are in the frog. The temperature falls.

Liebreich says apomorphine has no influence on the striated muscles, the motor, sensory or vasomotor nerves of mammals. Reichert, however, showed that toxic doses lower arterial pressure, following a distinct rise, which is prevented by previous section of the cord, and is therefore due to stimulation of the vasomotor centers. He also showed that apomorphine is a muscle-poison (Wood). Reichert's observations apply to toxic doses.

Apomorphine hydrochlorate forms small, white or grayish crystals, soluble in 6 to 8 parts of water, or fifty of alcohol, but not in ether or chloroform. Treated with nitric acid it forms a blood-red solution; with an excess of caustic soda a purple or dark solution. The watery solution is nearly or quite colorless; becoming emerald green in 100 parts of water it is to be rejected. It must give no color to ether. When released by soda bicarbonate apomorphine decomposes more easily than the chlorate, and is then soluble in ether or chloroform, with a purplish-red or bluish-violet coloring. Hence

a little hydrochloric acid improves the keeping quality of the solution.

Therapeutics.—As the only emetic for hypodermic use, apomorphine is of value in cases where quick, safe and sure emesis is necessary, with the minimum of nausea; as in treating unruly lunatics, drowning persons, those who have swallowed poison, as well as in croup, bronchopneumonia, and wherever it is necessary to free the pulmonary tract of secretions.

Liebreich says the expectorant effect may not appear for two days.

Vallender found it useful in epilepsy.

Sleep has followed its nauseant action in the insane.

Apomorphine has also been given largely in treating the alcohol habit, but the effect here must be credited to suggestion, as an effort is always made to have the patient attribute the nausea to liquor. If Murrell is correct, it is useless to add apomorphine to the liquor drank, as it will not nauseate. Emetine, lobelin or tartar emetic would be preferable.

In narcosis, even if the patient is too far gone for swallowing, apomorphine will still induce emesis.

Pecholier took hypodermically 0.015 (gr. 1-4) for angina, producing unconsciousness and cessation of respiration, recovering under stimulants, vomiting occurring after reaction. Large doses given to children caused rocking motion of the head and arms, twitching, chewing and hiccough.

As an expectorant apomorphine stimulates fluid secretion and liquefies tough, tenacious mucus; hence in dry catarrhs it is of use, and might be so in membranous croup and bronchitis were the effects more promptly manifested than Liebreich asserts. If Murrell's explanation is correct, the secretion-stimulus can be secured by injecting doses too small to cause emesis.

As an emetic to adults, the average dose is 0.007 (gr. 1-10) but in feeble "collapsy" subjects, half this dose is advisable. Murrell advises even larger doses by the stomach as an expectorant, but it is safer to adopt the "intensive" method of dosage, giving 0.001 (gr. 1-67) every half to two hours till effect. The depressant effects are combated promptly by atropine. When administered internally apomorphine should be given in granules, or in simple syrup (with hydrochloric acid) and the air excluded, when deterioration will not occur for weeks. Cushny, however, states that although the solution changes even to black, its activity is not appreciably impaired.

In narcotic poisoning the depression of the medullary centers may be too great to allow the action of apomorphine; when the stomach should be washed out. Or if the patient can swallow, a seidlitz powder should be given, first the contents of the blue paper in solution being swallowed, and then the contents of the white paper, also in solution. Effervescence occurs in the stomach, giving the most prompt emetic effect producible, without the slightest nausea or symptom of collapse.

All emetics are contraindicated in corrosive or irritant poisoning, in atheroma, fatty or dilated heart or aneurism, where a sudden rise of blood-pressure is dangerous; also in advanced pregnancy, reducible hernia, gastric or intestinal ulcer, impacted gall-stone, abdominal abscess, or in any other case in which a sudden strain may do harm.

Apomorphine in emetic doses, hypodermically, has been used with success to break up paroxysmal attacks of hysteria. Ringer says it cured a case of hiccough when morphine and atropine had failed. Weill and Gee found it useful in chorea.

Murrell believes the difference in the effect of apomorphine when administered hypodermically or otherwise is simply due to the rate of absorption. He found this salt could be applied to the skin as an ointment, in doses of 0.01—0.07 (gr. 1-6—1), well rubbed in, when it acted as an expectorant, inducing no nausea. This is a valuable method in treating children.

Brunton advises morphine and apomorphine given together for cough, to increase mucous secretion and lessen irritability of the respiratory center; especially when there is dyspnea, constant cough and tough mucus.

Murrell advises apomorphine in a spray, as an expectorant, using half a dram of the 1-per-cent solution, if needed.

Shoemaker mentions the use of apomorphine as a remedy for spasmodic croup, asthma, convulsions, strychnine poisoning, maniacal delirium, and to relax rigidity of the os uteri. He states that this drug should not be continued too long, as it is liable to produce pulmonary œdema.

The dose of apomorphine hydrochlorate as an emetic is 0.003—0.006 (gr. 1-20—1-10), as an expectorant 0.001—0.003 (gr. 1-67—1-20), according to Merck. It has been applied in skin diseases of infants in ointment of 1-5 of one per cent.

Apomorphine antidotes strychnine, chloral and chloroform, being a physiologic opponent of the latter two. It is incompatible chemically with alkalies, potassium iodide, and iron chloride.

In giving apomorphine to poisoned patients (children especially) it is well to give small doses of strychnine to support the heart.

It should be remembered that given per rectum apomorphine is emetic in doses of from 1-6 to 1-2 gr. There are times when this is the easiest and in fact the only way to give this drug: the patient cannot swallow and the attending practician may be far from his hypo. needle. If then he will empty the lower bowel and throw into it one-half grain of the drug, dissolved in an ounce of hot water, the characteristic effects will follow in less than ten minutes.

ARBUTIN.

Standard granules—Gr. 1-6, gm. .01; gr. 1-67, gm. .001.

Arbutin is a glucoside obtained from uva ursi, Gaultheria procumbens, pipsissewa, and other species of Arbutus. It occurs in silky, needle-like crystals, soluble in boi ling water and in alcohol, slightly in cold water. It is bitter, and the solution does not ferment with yeast. With iron chloride it gives a blue color. It is mostly excreted unchanged in the urine in a short time, a little being excreted in the urine as hydrochinone sulphuric acid. Lewin thinks the formation of hydrochinone may cause therapeutic effects in the urinary tract. Mencke hoped that arbutin might cure gonorrhea through the formation of free hydrochinone, but this was disproved by Paschkis.

Arbutin is undoubtedly the principle to which these plants owe chiefly their activity. It is stimulating to the renal cells, and mildly antiseptic. In large doses uva ursi causes vomiting and diarrhea, but arbutin does not have this effect. The leaves of uva ursi contain 3.5 per cent of arbutin and 34 per cent of tannic acid. Thus, in using the leaves to obtain 15 grains of arbutin, a full dose, one must take about 150 grains of tannic acid, besides enough woody fiber and other useless matter to make the dose up to an ounce.

Physiologic Action.—Brunton ranks arbutin among the astringents, coagulating albumin and constringing the cells, not the blood-vessels. It diminishes the exudation of albumin through the Malpighian tufts, more powerfully than tannic acid. Its specific value is in catarrhs of the bladder and the genitourinary passages.

Hughes found arbutin a powerful diuretic in doses of one grain. It is not toxic, as Jablonowski took within forty-eight hours 20 grams of it without discomfort. Though Brunton has shown that

arbutin is more powerful than tannic acid, Wood still asserts that the latter supplies the chief value to uva ursi.

Hydrochinone causes vertigo, ringing in the ears, the pulse soft and slow, according to Brieger. Martin found that in small doses it increased vasomotor tension, which large doses, however, relaxed; lowering body temperature by increasing heat-radiation, a result of vasomotor paralysis. Two per cent added to fresh urine prevents alkaline fermentation for many days. If present in large amount it renders the urine olive green, changing to dark green or black.

Therapeutics.—The specific indication for arbutin is atony or hypersecretion of the uropoietic mucosa. Introduced subcutaneously or by the mouth, arbutin is eliminated by the kidneys. It combats putridity and sepsis, acting alike on the tissues of mucous cavities and the urine contained. In acute or chronic cystitis, pyelitis, pyelo-nephritis, gonorrhea and leucorrhea it is useful. It corrects putrid fermentation of the urine with ammoniacal odor.

Ungar reported the case of a man, 68, with hypertrophied prostate, compelled to use the catheter since 1875, occasioning an obstinate cystitis. Urination was almost constant, the urine fetid and ammoniacal, in spite of intravesical washings with carbolic solutions one-half per cent, twice a day, with salicylic acid by the mouth. In 1879 grave hematuria appeared, repeated until 1883 at least weekly, lasting several days each time. Near the end of 1884 all other medication was discontinued and arbutin alone given for four days, in doses of 0.5, t. i. d., then 1.0 t. i. d., for three doses. The effect was very good. For some weeks the urine was free from pus and mucus, the bad odor disappeared, the hemorrhage ceased, the general health improved and the continual tenesmus subsided. Had not the continued use of the catheter reproduced the malady a complete cure would have been obtained. The patient, taking still two daily doses of 0.5 each, has not presented any therapeutic accident whatever.

Gris cites a case of pyelitis cured by Guyon by means of arbutin, and says he could cite other cases.

Viriate Brandao reported three cases of cystitis cured by arbutin, and declared that its use superseded the need of other remedies, sandal, balsam, etc. Hughes and Menches also made favorable reports on this remedy in cystitis.

Ferran lauds arbutin in his work on the maladies of old age.

While large doses are not toxic, they are largely wasted; as but a small quantity is decomposed into hydrochinone. The doses should

be repeated often—every hour or two—on account of the rapidity of elimination.

Houde recommends 0.04—0.08 every hour by day, and each time the patient rises at night to urinate. The daily dose should be from 0.6 to 1.2; or enough to stop urinary putridity.

Van Renterghem took in one day a gram of Merck's crystallized arbutin without experiencing any notable effects (in health). He recommends the administration of this agent every half-hour, to insure its continuous, uninterrupted influence; in doses of 0.01—0.02. He reports the case of a girl, aged 22, ill six months, menses stopped during this time, with grave vaginal blenorrhea and subacute vesical catarrh; excessive tenderness to examination, vagina dry, very hot, secreting fetid muco-pus; micturition constant, mucus fetid; sleepless, no fever, appetite and digestion good, stools twice a week, no syphilis.

Treatment. (1) The vagina was irrigated every three hours with warm borated chloral solution, chloral 1.0, borax 0.5, water 1000. (2) Enema daily of magnesium sulphate solution. (3) Hyoscyamine, a granule every fifteen minutes till effect, to relieve vesical tenesmus. (4) Arbutin 0.04, digitalin 0.001, every hour from 6 a. m. to 10 p. m.

Reported in one week. Since the second day could sleep all night, waking only two or three times to urinate; less frequent urination by day; the need of hyoscyamine subsided after the second day. She can now sit down. Genital pains and discharge subsiding, urine more limpid; on the road to recovery. A week later she reported the cure almost completed; she was attending to her housework. At her third visit the cure was found to be complete, and no relapse occurred.

Among the affections for which the arbutin-bearing plants have been recommended are lithemia, gout, rheumatism, dyspepsia, nephritis, hematuria, scrofula, skin diseases, gleet, leucorrhea and ague; as a diuretic in dropsy; in menorrhagia, chronic dysentery, bronchorrhea, diabetes, as a substitute for ergot to cause uterine contractions; and in enuresis.

It is obvious that the substitution of arbutin for the plants containing it opens up a new era in the treatment of genitourinary catarrhs. The enormous quantity of tannic acid and of woody constituents necessarily taken with the ordinary preparations of these plants, disguised the effects of arbutin, caused gastric and intestinal distress, and sadly interfered with the absorption of the arbutin.

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Besides, very little of this agent is present in watery preparations, unless taken quite hot. For these reasons uva ursi and its congeners, while acknowledged to possess a specific beneficial action upon catarrhal affections of the urinary passages, were rated as uncertain, feeble and ineffective remedies, and were prescribed as adjuvants or placeboes, with little expectation of benefit. Under the circumstances it seems surprising that they were retained in the official pharmacopeias—possibly the lack of anything better explains their retention.

But with the production of arbutin in a state of purity all this is changed. We have here an agent of unquestionable and remarkable power, with properties sharply differentiated from the tannin group of astringents. Indeed, to one who is familiar with the properties of arbutin, Wood's assumption that it is the tannic acid group to which uva ursi owes its effects, can only provoke a smile.

Arbutin is a tonic to the urinary mucosa, correcting relaxation, checking the discharge alike of albumin, pus, blood and mucus; and tending to restore the mucous membrane to a normal state. It is alike beneficial in gonorrheal and other catarrhs. It subdues irritability and soothes the excited viscus, relieving vesical tenesmus or strangury, not as hyoscyamine does by lessening nervous hyperesthesia, but by lessening the congestion and driving out the surplus blood. Its action is therefore more slowly manifested but more enduring than that of hyoscyamine.

Arbutin has proved alike beneficial in acute and chronic urinary catarrhs. It is of especial benefit when the urine is fetid and ammoniacal. In the vesical ailments of old men, with dribbling, frequent micturition, the calls to urinate being so imperative that the victim cannot get to the closet quick enough, but soils his clothes, arbutin is a remedy whose value will be manifested whenever it is used.

Secondarily, it is beneficial in atonic dyspepsia, which so frequently accompanies the urinary maladies of old men. This combination of properties places arbutin in the very front rank of remedies for this class of ailments, with no rival. It may be trusted implicitly—it has no bad after-effects of any description, no dangers lying in wait for over-doses.

In acute affections, in catheter cystitis, with fetid ammoniacal urine, it should be given in full dosage, up to a gram or more daily. In all cases Van Renterghem's advice should be followed, and the doses given every half-hour to insure a continuous action. In

chronic cases it may be given in increasing doses, beginning with 0.01 every half to one hour, and increasing until the urine is free from turbidity or blood, and then in sufficient doses to keep it clear.

The darkening of the urine from arbutin must not be mistaken for that caused by overdoses of carbolic compounds like salol. The latter breaks up the red blood corpuscles, causing hemoglobinuria, a dangerous toxic symptom; while the dark color of the urine from arbutin is due to hydrochinone and is not a toxic symptom. For this reason salol and arbutin, both useful in cystitis, should not be given together.

In very old and persistent catarrhs it has been found of benefit to alternate barosmin and arbutin and if it is given in alternation with benzoic acid in those cases where the urine is excessively ammoniacal the results are phenomenal. It will readily occur to the therapeutist that the reputation uva ursi has gained in conditions of excessive mucous discharges in the urine, is due to the presence of arbutin with a large amount of tannic acid; hence in some conditions it is advisable to give arbutin and tannic acid together or alternately.

ARECOLINE.

Standard granule—Gr. 1-134, gm. .0005.

All over the world in the highest grades of civilization and in the lowest savages, we find an almost universal tendency to indulgence in the habitual use of drugs, for the pleasure derivable therefrom apart from the relief of disease. Few families of the human race are without some form of alcoholic intoxicant. Tobacco had only to be introduced for the craving for it to arise. It is said that the Hottentots of Cape Colony sacrificed for tobacco the herds which alone afforded them security against starvation. Every plant in which caffeine has been found has been adopted as the basis of hot beverages, tea by the Chinese, coffee by the Arabs, chocolate by the Mexicans, guarana by the Brazilian Indians and maté by the Paraguayans. Opium, coca and hashish spread their baleful influence in spite of every consideration against them; while the newer creations of the chemist's art serve as the basis of new and disastrous habituations.

In Eastern Asia immense quantities of the areca nut are consumed, as a masticatory mixed with the leaves of the Piper betel. This is powerfully astringent, and the weak conclusion has been assumed, that the use of this substance is occasioned by the tendency

to diarrhea common in hot latitudes. No evidence is offered that the chewing is especially common to those so affected or that it is in anyway a preventive, or is so considered; and as with other habit-drugs we must until better data are obtainable be content with the explanation that men chew betel because they like to.

The betel nut is obtained from the Areca catechu, an East Indian palm. Jahns found in it three alkaloids, arecaine, arecoline and traces of a third, probably guvacine.

Arecaine occurs in stable colorless crystals, very soluble in water, in diluted alcohol, less in absolute alcohol, insoluble in ether, chloroform or benzine. It forms soluble salts and has an acid reaction. (Bocquillon Limousin.)

Jahns considers arecaine the active principle of areca, and pronounces it a powerful tenicide, resembling pelletierine. Half a grain kills a rabbit in a few moments. It resembles muscarine but depresses both respiration and heart, causes tetanic convulsions and increases peristalsis extraordinarily. Locally or internally used, it contracts the pupils. Dose 0.001 (Bocquillon-Limousin).

Arecoline $C_8\ HI_3\ NO_2$ is a volatile oil, miscible in all proportions in water, alcohol, ether or chloroform. It forms crystalline salts, and is pronounced very toxic. It exists in the nut in the proportion of about 0.1 per cent.

In doses of 0.025—0.050 hypodermically it killed a large rabbit; 0.020 killed a cat and 0.075 killed a dog. The heart-beats lessened until they ceased, the inspirations being augmented. (Bocquillon-Limousin.)

Arecoline hydrobromate occurs in white crystals, soluble in water and in alcohol. The dose for a horse is given as 0.03—0.06 (gr. ½—1).

Physiologic Action and Therapeutics.—Marme says arecoline resembles muscarine in its action on the heart, and depresses respiration. Fohner says arecoline hydrobromate stimulates the salivary glands more powerfully than pilocarpine and is a more active laxative than physostigmine.

It is especially used for colic of horses, in doses of 0.3—0.6 (gr. v—x) evidently a mistake for 0.03—0.06; to men for tenia 0.004—0.006 (gr. 1-15—1-10), and as a myotic. Dropped in the eye in 1-per-cent solution it produces violent mycosis, reaching its maximum in 10 and beginning to subside in 30 minutes. (Lavagna.) In 1½ hours the pupil is still somewhat enlarged. Intraocular tension is not modified. Increased refraction from ciliary spasm preceded iris dilation.

In glaucoma Lavagni and Bietti pronounce it superior to physostigmine though less enduring in effect.

Chetwood-Aiken confirms this opinion. No headache or other unpleasant after-effect is noted, as after physostigmine. He uses ½-per-cent solutions. A drop of 1-per-cent solution instilled into the eye causes lacrymation and ciliary spasm for a minute, slight hyperemia and subcorneal injection subsiding in a few minutes; in two minutes violent clonic spasms of the iris with dilatation of the pupils.

The point of especial interest to us is the effect of arecoline in stimulating peristalsis. If this effect can be produced by doses too small to cause suffering, it is an inestimable remedy; as it can be administered hypodermically. We would suggest that for this purpose a dose of 0.001 (gr. 1-67) be employed and modified according to results. A significant statement in Dr. Thomson's report is that the pain occasioned by a full dose does not last long, but that the cathartic action continues much longer.

ARSENIC.

Standard granules—Arsenic bromide, gr. 1-67, gm. .001; arsenic iodide, gr. 1-67, gm. 001; arsenic sulphide, gr. 1-67, gm. .001; arsenous acid, gr. 1-67, gm. .001; antimony arsenate, gr. 1-67, gm. .001; caffeine arsenate, gr. 1-67, gm. .001; copper arsenite, gr. 1-67, gm. .001; copper arsenite, gr. 1-1000, gm. .0000625; copper arsenite, gr. 1-250, gm. .00025; copper arsenite, gr. 1-100, gm. .0007; iron arsenate, gr. 1-67, gm. .001; iron arsenate, gr. 1-6, gm. .01; potassium arsenate, gr. 1-67, gm. .001; quinine arsenate, gr. 1-67, gm. .001; quinine arsenate, gr. 1-6, gm. .01; sodium arsenate, gr. 1-67, gm. .001; strychnine arsenate, gr. 1-134, gm. .0005; strychnine arsenate, gr. 1-67, gm. .001; strychnine arsenate, gr. 1-30, gm. .002; triple arsenates; triple arsenates, with nuclein.

No remedy has been so persistently advocated, in so many diverse maladies and so extensively administered and lauded as arsenic. And yet, a few years since an eminent American writer challenged the medical profession to produce one solitary instance in which unmistakable and undeniable benefit had accrued from the use of this medicine. It has seemed advisable therefore, that inquiry should be made, and the known facts concerning arsenic placed fairly before the readers of this work, that they may judge for themselves on what basis the employment of this metal as a medicine rests, and the evidence for and against its use.

In the preparation of this paper every accessible source has been drawn upon; and Dr. Epstein has especially searched through the

Russian and German works for material. It has been impossible to credit every statement made to its original author, but so far as possible the authority has been given. In the therapeutics of arsenic Ringer was the pioneer of small dosage, which he first introduced to modern medicine. For this he met much harsh criticism; and the opprobrious epithet, "disguised homeopath," was hurled at him from all sides; as it is now being projected at some other innovators; yet he and his suggestions survived, and the latter have been copied almost *verbatim,* with or without credit, by nearly every writer of therapeutic text-books since his work first appeared.

Toxicology.—Arsenic is so extensively employed in the arts at present that both the acute and the chronic forms of arsenical poisoning are common. Arsenic exists in considerable quantities in commercial sulphuric and muriatic acids, and hence enters many drugs and articles of commerce in whose preparation these acids are employed. Toxic effects have been noted from the arsenic in sulphuric acid used in galvanic cells and in that used in preparing glucose, from which poisonous beer has been brewed (Liebreich).

All the numerous bismuth salts are sometimes contaminated by arsenic and glycerin containing this impurity has proved toxic. Much damage is done by the arsenic retained by aniline dyes. Scheele's and Schweinfurth's greens are also responsible for many toxic accidents. Not only the greens but many other colors, used in dyeing domestic goods and tinting wall-paper, are arsenical. Wax tapers containing arsenic set free highly poisonous gases during combustion. Rat and fly poisons are generally arsenical. Even if the wall-paper showing is free from arsenic there may be some in the paste or in the old paper underneath.

Velour tapestry, tarlatan, stuffed birds cured with arsenic, artificial flowers and white muslin, have done harm by setting free arsenical dust.

In the arts many cases of poisoning occur from inhalation of arsenureted hydrogen, an unpleasantly smelling and highly dangerous gas.

Arsenic is alike toxic when taken into the body by the stomach or subcutaneously, inhaled as dust or gas, or when applied to the surface of wounds, from which it is readily absorbed.

Wines have been found to contain arsenic in France. In London milk was diluted with arsenical water.

There is little uniformity in arsenical poisoning, the symptoms varying with the form in which it is taken, the dose and especially

the solubility. Arsenical gases are most virulent; while the metal itself, unoxidized, is not toxic, a cat having survived a dose of 14 grams (over 3 drams).

When large doses of arsenic have been taken there may be no symptoms for half an hour or more; then a sense of tightness in the throat comes on, with difficulty in swallowing, gastric uneasiness, followed by gastric pain and cramps, vomiting and purging with rice-water stools later. The symptoms closely resemble those of cholera morbus. Blood appears in the matter vomited, and sometimes in the stools. The urine is diminished or suppressed. With these occur giddiness, headache, cold sweats, pallid, shrunken features, weak, thready, or imperceptible pulse, feeble, sighing respiration, muscular cramps if the loss of fluid is great and coma ending in death, sometimes preceded by convulsions (Cushny). The burning pain in the stomach never ceases while consciousness remains. Cramps of the œsophagus are frequent. Thirst is violent. The voice is rough and the tongue usually dry, but sometimes salivation occurs. Tenesmus, strangury and hematuria have been observed. The countenance is anxious, the patient restless. The pulse slows as death approaches, and consciousness weakens. These symptoms may continue from a few hours to as many days, according to the dose. If death occurs speedily it is due to the nervous influence and the circulation effects (Liebreich). If the dose is below the lethal, or is largely vomited, the patient may recover completely or pass into chronic arsenical poisoning. Sometimes the only symptoms are collapse and coma.

The fatal dose is uncertain. As arsenic is very difficult of solution it is doubtful how much is active at a given time. Recovery has followed the ingestion of very large doses, while 0.1 (gr. 1½) has caused death (Cushny).

Arsenous acid is the most frequent cause of arsenical poisoning.

The first indication is to wash out the stomach repeatedly. Fats lessen the solubility of arsenic and perhaps protect the exposed surfaces and should be given freely. Magnesia has some value as a chemical antidote, but the most highly favored remedy is iron, the freshly precipitated sesquioxide or dialyzed iron. These form a comparatively insoluble compound with arsenic. That it is not wholly insoluble is shown by the therapeutic activity of iron arsenate, hence evacuants should follow the use of the iron. To prepare the hydrated sesquioxide of iron, mix a solution of iron sulphate or chloride with any alkali, soda is best, and strain. An excess of alkali

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is to be avoided, as this would cause resolution of the arsenical precipitate. As the quantity of arsenic ingested is rarely known, the antidote should be given profusely, "by handfuls." For the collapse, warmth, caffeine and other stimulants are required.

When the arsenic has entered the circulation, when other forms of arsenic have been given, and when arsenical gases have been inhaled, we are powerless except as to treating the symptoms and sustaining the strength.

Chronic arsenical poisoning may be caused by a single dose, but usually it is due to the continued absorption of small quantities. Brouardel divides the course into four phases:

1. The victim complains of weakness, languor, anorexia, nausea or vomiting, weight and uneasiness in the stomach, diarrhea or constipation.

2. The conjunctivæ are red, the lids itch; coryza, sneezing and coughing occur; the liver may swell with jaundice; papules, vesicles or erythema appear on the skin, with pigmentation of the skin on the anterior surface of the body from the nipples to the upper thighs and in the axillæ or other parts. There may be brown circumscribed patches. This pigmentation generally disappears when the arsenic is suspended, but may be permanent. In prolonged poisoning the eruptions may resemble almost any skin disease, the hair and nails may fall, and deep gangrenous ulceration has been observed.

3. Sensation and motion are disturbed, in limited areas, often in the hands and feet. There is intense, persistent headache, or acute pain in knee, ankle or foot, less often in the upper extremity; formication, the pressure of bedding on the legs and feet is uncomfortable; sensory paralysis follows, the sense of touch is weakened, those of cold, heat, or pain increased or lessened. Symptoms closely resembling locomotor ataxia may occur, especially in subacute cases; coördinative disturbances, absence of patellar reflexes, and lightning pains, may simulate ataxia.

4. Motor paralysis follows usually in the extensors of the toes, then in the peroneal group; rarely in the flexors of the foot and leg, or the extensors of the hands and fingers. Usually the paralysis is confined to the extremities but it sometimes extends to the trunk. It is usually symmetrical; the affected muscles atrophy rapidly, and respond slightly to galvanism, but not to faradism except at first. This diminution of excitability may appear before the reaction of

degeneration, which then follows. Mechanical stimuli excite the muscles abnormally.

Lead paralysis may be distinguished by the history of prolonged poisoning, the sensory ailments occur later, the forearm is usually first affected, there is the lead line on the gums, and atrophy of the muscles occurs much later.

Arsenical paralysis may appear three days after acute poisoning, but usually occurs later, perhaps not for a month. The sexual function may be stimulated or depressed. In subacute cases the stomach may reject everything swallowed, and great emaciation result. In prolonged cases the victim may sink into an apathetic, demented or epileptic state.

Usually when the poison is withdrawn the symptoms gradually subside, but gastric irritability, contractures, sensory disturbances and paresis may remain. Weak vision, mild optic neuritis and amblyopia have been noted. If degeneration of the muscles has occurred little improvement is to be expected. Herpes zoster occurs sometimes on the face or on the trunk. Some of the skin affections seen are due to the direct action of the drug; in men handling it, the malady first appearing on the hands is then carried to the nose, arms and genitals. On the genitals a characteristic ulceration sometimes occurs, termed "arsenical chancre." The absence of glandular swelling, the slight hardening and the history, serve to distinguish these from the specific chancre. Blisters, urticaria, eczema and erythema may occur.

The phases of Brouardel are not always distinct, the symptoms of the second sometimes appearing first and those of the others together. When arsenic is given medicinally the first symptoms of saturation, or toxic action, are redness, inflammation and itching of the eyelids and conjunctivæ, with dry nose and throat, or coryza. Workmen inhaling arsenical dust suffer bronchial irritation or cutaneous disorders.

Physiologic Action.—In the alimentary canal arsenic produces effects similar to those of corrosives; it, however, does not coagulate or unite with albumin. The mucous membrane is red and swollen, the epithelium fatty, sometimes showing ecchymoses. The whole or parts of the gastric mucosa may be affected. If solid arsenic lies long on the membrane, erosions may be formed. From these red lines lead along the sulci where the dissolved arsenic ran. Sometimes the only lesion is the cloudy swelling of the fatty gland-cells.

The bowels present a similar appearance, most marked around

Peyer's patches. Even after profuse vomiting and purging small particles of arsenic may be found. The pharynx and œsophagus may be congested. From the stomach downward the appearances become less marked, being least in the rectum. The gastric lesions are rarely due to direct contact with the arsenic, and are caused by its excretion, with the aid of the gastric juice (Filehne). The bowels contain the "rice-water" material and necrosed epithelium in profusion.

The liver shows marked parenchymatous turbidity, fatty degeneration and necrotic spots.

Boehm attributes the gastro-intestinal lesions to the action of the arsenic causing extreme dilatation of the blood-vessels, with consequent congestion and destruction of the epithelium, and transudation of serum beneath it.

Schmiedeberg thinks that arsenic has a specific action in causing fatty degeneration of the gastro-intestinal epithelium. This destructive action may be beneficial when present in the mild degree following the use of arsenic in medicinal doses, promoting appetite and digestion. In the spinal cord arsenic induces localized myelitis. The rapid respiration at first, and paralysis of the vasomotor centers, indicate a direct action on the medulla. Tenderness of the nerve-trunks points to peripheral neuritis, and this may ascend to the cord; or, *vice versa* (Cushny).

The pulse is accelerated by small doses and slowed by large ones, inhibition being unaffected. The vascular tension rises at first, falling soon after large doses; the vasomotor centers and later the splanchnic nerves losing control over the vessels (Pistorius).

The vascular pressure may be restored by stimulating the vasomotor center, but only at first; while splanchnic stimulation still increases the tension. Later, these nerves fail, through paralysis of their ends or of the vessel walls, while other vasoconstrictors can still contract the vessels.

Respiration is hastened at first by small doses, then returns to normal. Later, it ceases before the heart stops from exhaustion and low blood-pressure.

If arsenic is applied to the unbroken skin it is unaffected unless contact is continued, when redness, vesicles, pustules and later violent erythema appear. There is no corrosion, and subcutaneous injections of arsenic are painless. Applied to denuded surfaces or mucous membranes it causes acute pain and slowly destroys the tissues. It acts only on living cells, not on dead tissues. When animals

are taking arsenic the epidermis peels off easily (Ringer). This is due to softening of the protoplasm in the deeper epidermal cells (Nunn). Similar changes occur in the eye. The melanosis seems to be due to the deposition of some organic product in the deeper layers of the corium. Mucous irritations are caused by the excretion of arsenic on their surfaces. Arsenic has been found in the serum of blisters of animals taking the drug (Cushny).

On the blood the action of arsenic is obscure. It lessens the number of red corpuscles, but not the total hemoglobin. In pernicious anemia it increased the number of young red cells while the mature cells lessened (Engel). Silbermann says it induces widespread intravascular coagulation, leading to a fall in blood-pressure and to anemia. Heinz adds that arsenic also induces thrombi of blood-plates, which cause the ecchymoses and ulcers.

Fever is sometimes present in arsenical poisoning, due to the inflammations. Metabolism is affected by arsenic, the nitrogen in the urine is increased, ammonia is augmented and the alkalinity of the blood is reduced by the formation of lactic acid in excess. The glycogen entirely disappears from the liver and is not formed from the food. Puncture of the medulla does not cause glycosuria, though curarine still elicits it. Fatty degeneration of the epithelium is found in the liver, kidney, heart-muscle, blood-vessels, striated muscles and pulmonary alveoli. Necrotic foci are found in the liver with active division of the hepatic cells (Wolkow).

Cushny sums up these effects by stating that arsenic lessens the oxidation of the tissues and causes fatty degeneration of the protoplasm; it may increase the waste of proteids, directly or secondarily to the decrease in oxidation. These effects are simply less in degree than those of phosphorus. Improvements in nutrition from the prolonged use of arsenic in medicinal doses is well attested. Weiske explains this by the theory that more food is digested and less proteid decomposed.

Arsenicophagi.—Tolerance is sometimes established when arsenic is taken habitually. The Styrian peasants who eat arsenic believe it enables them to work better, to climb mountains with less effort, especially of the lungs, that it improves their complexions, makes their horses' coats glossy, and the animals stronger and fatter. Arsenic is said to be taken by these men up to 0.5 (gr. 7½) at a dose, but Murrell puts the maximum daily dose at slightly more than ½ grain. These peasants are "said to" live to old age, with no evil results, and to enjoy unusual sexual powers. And on this "say so"

is largely based the use of arsenic as a remedy. Experiments on animals have not created toleration but chronic poisoning; and the allegations as to increased endurance of fatigue by arsenic eaters are as yet unproved, and contrary to modern scientific observations.

A review of these accounts shows that the good effects are not uniform, but that many die from the drug; that the habit renders its continued use necessary; and that the alleged benefits are no more than could be ascribed to the healthy life of the mountaineer, whose great respiratory capacity is necessitated by the attenuated atmosphere.

The observations of Schallgruber, von Tschudi and others, of the Styrian arsenic eaters, appear so contradictory to the common experience of the scientific world in general, that some further investigation seems desirable. Gies experimented on animals with the following results:

1. Badly nourished rabbits could not bear the smallest daily doses of arsenic (0.0005—0.002), but became progressively dejected, refused to eat, developed diarrhea, emaciated, the coat became rough, and died within three and a half weeks. The autopsy showed always catarrh of the stomach with thickened mucosa, fatty liver and other evidences of arsenical poisoning.

2. Young, immature rabbits, pigs and chickens, tolerated the above doses very well, and as shown by comparison with control animals, grew stronger and larger in all ways, more energetic, with finer, sleeker coats, fatter, the bones longer and thicker. Their young also were superior in size, strength of bones and size of thymus, but were born dead—possibly by reason of their abnormal size. But animals kept in cages with those fed on arsenic, or with arsenic scattered under the perforated bottom of the cages, showed the same improvement, though to a less degree.

3. Full-grown rabbits given arsenic acid, 0.0005 daily for 40 days, did well, fattened, and had a thick layer of arsenic in the cortex of the diaphyses, but not in the epiphyses, where growth had ceased. But the liver, heart and kidneys were fatty (degenerated).

4. None of the animals could be habituated to the higher doses; for when the metal was increased the bone-changes (especially in hens) stopped, and signs of chronic poisoning appeared, emaciation, falling of hair, intense gastrointestinal hyperemia, with violent purging, and extensive fatty degeneration of the heart, liver, kidneys and perhaps the spleen.

Schæfer records thirteen sudden deaths among arsenic eaters in

Gratz alone within two years. Toxic symptoms also frequently appeared in persons taking minimal doses.

From the facts Nothnagel concludes that arsenic habituation, even to minimal doses, is by no means a rule without exceptions, and that the physician prescribing this drug should carefully ascertain the patient's resistance to it.

But Knapp produced a man who swallowed at one dose 0.4 (gr. vj) of arsenic acid, with impunity. Hebra gave 0.06 daily; and Kaposi 22.5 grams in a year to one case. However, the duration of tolerance has not been determined, nor whether death does not finally result from the arsenic. Knapp recovered from the urine of arsenic eaters, 0.032 to 0.029 of the metal, showing that that quantity traversed the system daily without symptoms of chronic arsenic poisoning.

The residents of Whitbeck, England, use an arsenical water habitually. Beginners experience dryness of the mouth and throat, but this quickly passes off. These people are said to reach old age as a rule; a statement that needs confirmation. While the Styrians are said to take as much as 1.5 grain (Heisch) *per diem*, or once a week perhaps, the Whitbeck people take much less. Arsenic eaters avoid drinking just after taking the poison, and some avoid fats. Some suspend the arsenic and take purgatives at times. The women are said to get fat, with pure complexions and rosy color; but I have never been able to obtain this effect from arsenic. On the contrary, the American women who take arsenic become dark, even like the victims of Addison's disease.

The mountaineer believes arsenic improves his lungs, so that he can climb without fatigue or dyspnea. The disuse of the drug is followed by weakness in this respect, which disappears when it is resumed. Whether, however, those who do not use arsenic do not develop equal lung-power, is not settled. It is admitted that arsenic does not always produce the good effects described, and that large doses entail serious inconvenience. Even Tschudi admits that some become sick and marasmic from the drug. Arsenical paralyses are rarely seen.

Excretion.—Arsenic is largely excreted by the kidneys, to a less degree by the gastrointestinal and respiratory mucous membranes, traces being found in the skin, hair and milk. Fatal intoxication occurred in a child whose mother suffered acute arsenical poisoning. Excretion is slow, arsenic being detected in the urine three months after it was last taken. The effects remain long after the drug has been excreted.

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Arsenic is found most largely in the liver; also in the kidneys, stomach, intestines, spleen, lungs, and traces in the muscles and nervous tissues. In the blood it is found in the cells. It has been found in the bones after having disappeared from the other tissues.

As an antiseptic, arsenous acid is one-tenth as strong as corrosive sublimate. The spores of anthrax are destroyed only after ten days' immersion in 1-1000 solution (Koch). It has no action on ferments, moulds and algæ. The bodies of persons dying from arsenical poison are said to remain long undecomposed, but this is disputed.

Binz and Schultz explain the action of arsenic by supposing that arsenous acid is oxidized into arsenic acid in the tissues, and the arsenic acid again reduced to arsenous. Oxygen is thus alternately withdrawn from and again supplied to the protoplasm.

Arsenureted hydrogen is exceedingly poisonous and many fatalities occur from its inhalation in laboratories. It acts as a molecule, AsH_3, arsenites as ions. It destroys the red corpuscles, inducing intense headache, nausea, vomiting, prostration, syncope, cyanosis and collapse. The hemoglobin is reduced. Methemoglobin, hematin and even blood are passed in the urine. Rarely the stools contain blood. The uriniferous tubules may be plugged by debris. Intense jaundice may occur. Death is due to pulmonary œdema or to heart-failure. The gas may be excreted by the lungs and is known by the garlic odor. The absorption band of oxyhemoglobin disappears before this is reduced, when further decomposition of the blood takes place (Liebreich).

Bunsen asserted that cacodylic acid compounds are non-toxic, but Schulz has shown this to be erroneous. Loew has shown that when arsenous acid is injurious to plants it is only as an acid injuring the protoplasm, since spirogyra thrives in water containing 2 per cent of arsenic acid neutralized by potash.

Therapeutics.—In spite of the very full account given of the effects of arsenic in the human body, we are struck with the fact that scarcely a single therapeutic use of this agent is deducible therefrom. Excepting the possible use of arsenic in diabetes mellitus, we have only the hazardous surmise that, since arsenic physiologically affects certain tissues, such as the skin, it may possibly be found effective in combating pathologic conditions of these tissues. But arsenic acts as a poison, first and last; and the indications for its use are purely empirical. It is questionable whether the constantly recurring advocacy of arsenic as a remedy in all sorts of maladies, especially those usually considered incurable, such as carcinoma and tuber-

culosis, is not due to the somewhat superstitious idea of its powers arising from its alleged use by the Styrian arsenicophagi. This tale seems to have been accepted for generations with very little attempt at verification; and even if these people have acquired a hereditary immunity against arsenic, which has not been claimed, but might be, the experience is altogether exceptional, and nothing like it has been observed in other races and lands. Altogether the tale bears many of the earmarks of a "traveler's yarn," so far as the good effects of the habit are concerned.

In the skin we look for the first evidences of therapeutic action. On syphilitic dermatoses arsenic has no effect. On general eczema, especially the chronic forms, psoriasis, urticaria, lichen, and sometimes on pemphigus, leukemia and pseudoleukemia, arsenic has a beneficial effect. Acne is benefited in proportion as the general health improves, but rosacea is improved or cured. Over lepra, arsenic has no control, nor over furunculosis. The drug should be commenced in minute doses, increased until toxic action begins, when the curative effect should be manifested.

Chronic affections require chronic treatment, and in lichen ruber Hebra gave arsenic for two years.

Malignant lymphoma can be cured by arsenic. During each decade of the last century arsenic was brought forward as a cure for cancer and in each case the claim was disproved (Nothnagel).

Lipp introduced the subcutaneous injection of arsenic in lichen ruber and other dermatoses. The method has value, but fatty liver has developed under it. The injections are apt to cause abscess unless carefully sterilized. Sodium arsenate is preferable for hypodermic use. Little benefit will follow the use of arsenic in skin diseases unless the digestion is carefully regulated.

Buchner believed that arsenic renders the body immune against the tubercle bacillus, but this has been disproved. If phthisis is primarily a malnutrition opening the way to the bacillus, it is easy to conclude with Leyden that arsenic can have no effect. Nor does arsenic develop a high state of nutrition, or favor the elimination of microörganisms. Moreover the parasiticide powder of arsenic is slight, and it cannot hinder the multiplication of bacteria, nor has it proved effective in lupus, even in toxic doses, where its decided predilection for the skin would render its use advisable, *a priori*. Yet Landerer has obtained good results from subcutaneous injections of arsenic in lupus.

In chronic malaria arsenic has proved undoubtedly a very ef-

ficient remedy. After the sequence of chills has been broken by quinine, arsenic may be depended upon to remove the relics of the malady. Iron is usefully conjoined.

Pellagra is controlled by arsenic.

In diabetes arsenic has been employed with varying effect. Arsenic bromide obtained some repute in this affection. The evidence seems to show that arsenic succeeds only in exceptional cases, and as yet the class in which it is best to use it has not been distinguished. The best results have been obtained by giving the bromide in maximum doses for several weeks.

In neuralgia arsenic has been largely used as a remedy for the intervals, in the belief that it exerts a useful influence over the nutrition of the nerve-centers. The fifth cranial nerve has been thought to come most directly under its influence.

Isnard gives arsenic in nearly all purely functional neuroses, especially "general nervousness."

Romberg thinks most benefit is obtained when reflex neuralgia has as its basis uterine or ovarian disease, especially if the patient is anemic, while in plethoric cases the effect may be hurtful.

Chorea usually subsides under the use of arsenic, but this malady usually subsides in six or eight weeks under any treatment. In calisthenics, macrotin, hyoscine and cicutine, with personal and moral hygiene, we have remedies for this affection of more assured value.

In chorea the cause, rheumatism, psychic influence, etc., has no influence on the control exerted by the arsenic (Nothnagel).

Tremors connected with centric neuroses, disseminated sclerosis, etc., are amenable to arsenic hypodermically (Eulenberg).

Kuelz and Fuerbringer, after careful experiments, conclude that the apparent benefit from arsenic in diabetes is due to the lessened ingestion of sugar-forming foods, caused by the gastric irritation which is induced by the remedy.

In that form of cardialgia occurring usually at night, without palpable change in the stomach, in middle-aged persons exposed to mental strain, arsenic is the only useful remedy (Leared).

In malignant lymphoma arsenic was used internally and injected into the gland, with a decided decrease of the growth and even a perfect cure (Billroth, Czerny, Winiwarter, Israel, Karewski and Warfingh).

One case of general cutaneous sarcoma was cured by arsenic hypodermically (Koebner).

In pernicious anemia arsenic has been used with asserted benefit, and in leukemia it has been given internally and injected under the skin. Judgment deferred (Nothnagel).

Children bear arsenic relatively well. In old age it easily begets digestive disturbances. It is contra-indicated by gastric irritations, and fever, not malarial (Nothnagel).

Seguin advised large dilution with water.

Some begin with small doses and ascend, others the contrary. When evidences of toxic action begin, the drug must be stopped at once.

The moderate uses of arsenic in small doses may be traced back through all the modern text-books to Ringer. He advised this agent in several forms of spasmodic sneezing, with itching beginning at one spot in the naso-pharyngeal mucous tract, tending to recur more or less constantly on slight provocation. He also advised arsenic for rumination, merycismus or the regurgitation of food without nausea, for chronic bronchitis with free discharge of thin sputa, in non-febrile catarrhs, and the early stages of pulmonary phthisis. In rheumatic gout he employs a bath containing four ounces of washing soda and a scruple of sodium arsenate.

He describes an affection of the tongue in children, a circular rash, beginning at a point, enlarging, with rings coalescing like ringworm, the surface abnormally clean, obstinate and prone to recur, and associated with gastric or intestinal ailments, obstinate diarrhea, or lichen urticatus. In this arsenic proves useful.

In asthma and chronic forms of phthisis he employs cigarettes, made by saturating blotting paper with a solution of fifteen grains of potassium arsenate in an ounce of water. For sloughing of the mucosa of mouth or throat, malignant sores, chronic coryza, any malady alternating with sneezing, and the collapse stage of a choleraic attack, he praises the effect of arsenic. Ringer also recommends arsenic in small doses before meals in anorexia, gastric neuralgia, lienteric diarrhea, irritative dyspepsia, gastralgia, heartburn, the vomiting of drunkards, or of gastric ulcer or cancer. In a large group of nervous maladies this metal has been highly praised; especially in tic douloureux, hemicrania, neurasthenia, angina pectoris, chorea, epilepsy, asthma, whooping-cough, hay-fever; as a rule being best given in the intervals to prevent the recurrence of paroxysms.

Brunton verifies most of Ringer's suggestions, and says that in malaria arsenic sometimes acts better than quinine, and as a rule

excels the latter in latent, masked and irregular forms, manifested otherwise than by periodic chills and fever. As a prophylactic against malaria several observers place arsenic above quinine. Brunton strongly urges arsenic in catarrhal pneumonia with delayed resolution. This condition offers a most favorable opportunity for the domiciliation of the tubercle bacillus. Arsenic attacks the consolidation, favoring the occurrence of fatty degeneration, softening and absorption, and hence is prophylactic against tuberculosis. I would advise arsenic iodide for this purpose.

Hunt says arsenic is harmful during the inflammatory stage of eruptions; but Erasmus Wilson gave it in the acute stages of eczema, only using very small doses.

Simpson found arsenic useful in mucous colitis and in membranous dysmenorrhea. In the former malady it has not given me as good results as the silver salts. Murrell alludes to the effects of arsenic given to horses. It makes the coat sleek and smooth, but when the arsenic habit is formed the animals droop and suffer if deprived of it.

Shoemaker pronounces arsenic the only known remedy that has any effect in restraining the development of visceral cancer. Wright regards arsenic bromide as the best remedy against cancer.

Bryan considers arsenic a prophylactic against scarlatina and possibly influenza and diphtheria.

Phillips found it beneficial in scarlatinal albuminuria. It is said to relieve hemorrhoids, and certainly relieves the rectal excoriations common in those subject to acidity and heartburn. Sawyer found arsenic effective in those cases of gastric pain where the taking of food gave temporary relief. Sometimes obstinate forms of syphilis that resist mercury and iodine improve at once where arsenic is added to the foregoing. Drew praised arsenic in splenic leukemia, and Hare advocates it also in leucocythemia and pseudoleukemia, if given persistently up to full tolerance.

It has been advocated in amenorrhea when due to uterine congestion, to anemia or chlorosis. Butler advises arsenic in Hodgkin's disease, in melancholy and hypochondria, especially of the aged.

Sympson gave arsenic internally, continued for several weeks, for warts, finding that they gradually disappear.

Externally, arsenic is used as an application to cancerous growths. The effect is not due to coagulation but to a devitalizing of the protoplasm. In lupus, by painting with Fowler's solution, cicatrization may be produced, but the disease is only veiled.

In the form of Abbott's paste arsenic is employed by dentists to kill the nerve, when the dental pulp is exposed. A bit of the paste the size of a pin-head is introduced in the cavity, first cleaned out and dried with absorbent cotton; then a bit of cotton dipped in damar varnish is inserted to seal the cavity and prevent communication with the fluids of the mouth.

In all external uses of arsenic the danger of poisoning by absorption must be recollected.

Brunton advises a paste of arsenous acid two drams, cinnabar two drams, ashes of old leather eight grains, dragon's blood twelve grains, with water or saliva. Any arsenical paste should contain at least 20 per cent of arsenic in order that the destructive action shall be thorough. A weaker preparation is apt to cause poisoning through absorption taking place before the tissue has been devitalized.

Hebra's paste consists of arsenous acid fifteen grains, cinnabar three grains and an emollient ointment twenty-four grains.

Marsden mixed one ounce each of arsenous acid and acacia, with five drams of water. Of this he painted several coats over epitheliomas, carefully confining it to the growth and covering not over one square inch at once. This is a good rule in all arsenical caustic applications. The sloughing tissue should be removed by poultices. Some cut grooves into the cancerous mass and fill with the paste, leaving it till the tissues are dead. Hue and Paanel injected solutions of 1 to 1000 into inoperable cancers.

Manec's paste consists of fifteen grains arsenous acid, seventy-five grains of black mercury sulphide and thirty-five grains of burnt sponge; but this seems too weak for safety.

Orpiment, an arsenical ore, is sometimes used as a depilatory; one part with five of slacked lime forming "Rusma Turcarum;" and five parts orpiment, fifty of slacked lime and thirty of starch, forming Plenck's depilatory. The latter is to be kept in a well-stopped bottle to exclude air. A little is moistened, made into a thick paste and applied to the hairy parts for a short time, then scraped off with a dull knife.

Ringer painted corns and warts with Fowler's solution; but as to corns I must warn against the use of every species of caustic.

In administering arsenic, whenever the effect desired is allaying pain or irritability of the stomach, the dose should be very small and administered when the stomach is empty. If it be desired to obtain the full constitutional effect, as in combating malaria or an in-

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veterate neurosis, it is usually recommended to give the remedy after meals and push to full toleration. This is based on the belief that the large dose unites with the food and is absorbed in some unknown, non-irritant form. Were this true, it seems incumbent on us to ascertain what this form is, and to use it. But the fact seems to be, as shown by Bartholow, that even the very small doses if given on an empty stomach produce constitutional effects as readily as very large ones given with the food. It seems probable therefore, that most of the dose taken after meals is rendered insoluble, by the iron probably, and excreted in the feces, so that this method of dosage is uncertain and dangerous, as one never knows when conditions may arise in the gastro-intestinal canal to render the whole dose absorbable, with toxic results. It is much safer and more effective to administer small doses before meals; and if a full physiologic effect rapidly produced is desired, to give a minute dose every hour until the eyelids begin to itch.

Murrell says that a child five years old will take nearly the adult dose; and that girls require larger doses of arsenic than boys. Bouchet and Lewald found arsenic in a nursing mother's milk.

Merck's Index gives the following data on the various preparations of arsenic utilized in modern medical practice:

Arsenic bromide (tribromide). Dose 0.001—0.004; maximum 0.01. Soluble in water.

Arsenic chloride (trichloride). Dose 0.001—0.004. Soluble in all proportions in alcohol; in ether and oils. Decomposed by water, with which it is incompatible.

Arsenic iodide (teriodide). Dose 0.001 to 0.004; maximum single dose 0.008. Soluble in ether or in carbon disulphide; in seven parts water or thirty parts alcohol. Decomposed by water.

Arsenic sulphide (trisulphide). Soluble in alkalies, their sulphides or carbonates.

Arsenous acid. Dose 0.001—0.002; maximum single dose 0.005, or 0.01 in a day. Soluble in water very slightly; in alcohol; freely in hydrochloric acid.

Copper arsenite. Dose 0.0005 every half-hour; maximum 0.006. Soluble in alkalies, slightly in water.

Potassium arsenate. Dose 0.003—0.006; maximum single dose 0.006, or 0.02, daily. Soluble in water.

Sodium arsenate. Dose 0.001—0.008. Soluble in four parts water, two of glycerin, or sixty of boiling alcohol. This salt is less irritant to the stomach than most other arsenical preparations.

Iron arsenate. Dose 0.004—0.008. Soluble in dilute hydrochloric acid.

Quinine arsenate. Dose 0.004—0.008. Soluble in hot water.

Caffeine arsenate. Soluble in hot water.

Atropine arsenate. Contains 19.72 per cent arsenic and 80.28 of atropine. Soluble in water and alcohol.

Strychnine arsenate. Dose 0.001—0.004. Soluble in fourteen parts of cold or in five parts of hot water.

Antimony arsenate. Dose 0.0013.

Burggræve ascribes a deobstruent value to antimony arsenate, and advises it in chronic pulmonary affections, and in muscular rheumatism.

The salient points on which to base the therapeutic use of arsenic are: first, its power of stopping glycogen formation; second, of checking emaciation; third, of causing gastric irritation when exhibited in toxic doses. It is not unreasonable to attribute to small doses a useful degree of irritation, with exaltation of function, corresponding to that produced by non-toxic doses of all other gastric irritants.

The arsenites are preferable to the less soluble arsenous acid for internal use, and their number, and the combination with such useful agents as strychnine, iron, quinine, caffeine, copper, etc., give an unusual opportunity for nice selection.

The observation of Ringer as to the curative power of arsenic in the peculiar affection of the tongue he described, also favors the use of this agent in gastric affections, as the diseases of the tongue are so frequently dependent on disorders of the stomach.

Finally, we cannot too strongly urge the necessity of distinguishing between the effects of large and of small doses in administering arsenic. In malaria, where it acts directly as a germicide, the full quantity tolerated is obviously required; but in nearly all cases where arsenic has won favor it has been when given in doses far below the toxic point.

ASCLEPIDIN.

Standard granule—Gr. 1-12, gm. .005.

Asclepidin is a concentration from the root of **Asclepias** tuberosa.

The virtues depend on a glucoside obtained by Quackenbush in a crystalline form. It has not been produced commercially.

King says asclepias is diaphoretic, diuretic, laxative

minative, expectorant and probably antispasmodic. Being unstimulating it may be used as a diaphoretic in the highest fevers. The secretion from the skin produced by it closely resembles the normal insensible perspiration. The solids excreted are largely increased, rather than the fluid. Even when there is a free perspiration asclepias may be needed to increase the solids excreted. It does best when the fever is not too high, the skin slightly moist, the pulse vibratile and not too rapid. Aconitine should be added if the pulse be rapid, weak and small; veratrine if strong and bounding.

Therapeutics.—Asclepidin increases the respiratory secretions and favors expectoration. Its power of naturally stimulating the skin renders it efficient in colliquative sweating. It has been termed pleurisy root from its value in this malady, where it may be combined with bryonin or aconitine. In pleurodynia, intercostal neuralgia and rheumatism, and in pericardial pains it is effective. Its chief action being to relax arterial tension, it is best suited to acute attacks. It is a useful adjuvant in early pneumonias and pleuropneumonias, pulmonary hyperemias and extensive bronchitis, in the early and the convalescing stages.

It relieves dry coughs if given following lobelin. It is among the best remedies for catarrhs of children. In phthisis it relieves the cough and the mucous irritability. It is one of the best remedies for colds, and for all respiratory and gastrointestinal catarrhs when due to recent colds. Asclepidin benefits gastric troubles of children, catarrhal diarrheas and dysenteries, the headaches of indigestion, flatulent colics, dry skin diseases, neuralgias, rheumatism with free sweating. It favors the eruption in the exanthemata, and sometimes relieves painful inflammations by the perspiration it induces.

Scudder gives these specific indications for asclepias: Pulse strong, vibratile; skin moist; pain acute, seemingly dependent on motion. King says the skin may be hot and dry or inclined to moisture, urine scanty, face flushed, vascular excitement marked in parts supplied by bronchial arterioles, serous inflammations, gastrointestinal catarrhs caused by recent colds.

Ellingwood says asclepias is specific for pleuritic pains, facilitating the rapid removal of the effusion. For stomach pains it should be given in full and continued doses. It soothes the entire intestinal mucosa.

For acute maladies asclepidin may be given in doses of gr. 1-12 to 1-4 in a cup of hot water, repeated every half-hour till effect. In chronic maladies the dose is a grain before meals and at bedtime.

ASPARAGIN.

Standard granule—Gr. 1-67, gm. .001.

Asparagin is a glucoside found in many plants, but in greatest quantity in the vegetable asparagus. The well-known odor imparted to the urine by eating asparagus is not due to this principle, however, but to methylmercaptan. To this odor is possibly due the repute asparagin holds as a diuretic, a doubtful matter, as neither Falck, Jacobi nor Posner obtained any diuresis from doses up to fifteen grains. Nor was the pulse notably affected. Huesemann also failed to obtain any useful effect in dropsies dependent on heart disease.

But there are other functions of the human body besides the few that have been selected as tests of remedies. In the plant world asparagin fills a place analogous to that of urea and uric acid in the animal, as one of the principal products of albuminoid decomposition. But while urea and uric acid become useless to the animal and must be eliminated from the body, asparagin, produced by the destruction of a molecule of albumin, can be immediately utilized in the green plant, and serves to build a new molecule of albumin. In the legumes asparagin, formed and accumulated at the moment of germination and produced by the destruction of the reserve of albuminoids utilized during germination, disappears subsequently when the young plants become charged with chlorophyll. Thus the disappearance of asparagin coincides with the formation of an equivalent quantity of a new albumin.

Therapeutics.—It is likely that asparagin increases the excretion of solid matters by the kidneys, since it has won some repute as a remedy for gout, milder than colchicine. As long as all diuretics are judged by their power of reducing dropsical effusions, there is little chance of estimating the true value of such remedies.

Asparagus has been accredited with aphrodisiac and emmenagog properties. It sometimes causes a urethral discharge like that of gonorrhea, and its use may increase the irritation of that malady. It has been used in place of ergot to stimulate uterine contractions after miscarriage or in the later stages of labor. Sometimes it causes serious disturbance of the renal function. Its use has been proposed as a means of testing the permeability of the kidneys: If the characteristic odor of the urine does not follow the eating of asparagus any remedy excreted by the kidneys is apt to accumulate in the body and cause poisoning.

Dr. E. A. Welch, of Sutton, Mass., reported two cases of cystitis in which he found benefit from asparagin. Several others have reported this agent as giving a more pronounced diuretic action than the foregoing account would indicate.

ASPIDOSPERMINE.

Standard granule—Gr. 1-67, gm. .001.

Some years ago the medical profession welcomed a new applicant for favor, in the form of quebracho, an extract from the bark of an evergreen tree of South America. It was presented as a specific remedy for the symptom of dyspnea, occurring in the course of any malady. Investigation showed that this extract contains at least six alkaloids, whose properties differ to some extent, though, as in the case of the digitalis glucosides, there is a strong similarity in their action.

Harnack and Hoffman found that aspidospermatine causes in the frog paralysis of respiration and of all striated muscle, including the heart. In mammals the most marked action is on the respiration.

Quebrachine exerts a precisely similar action on the frog, but is twenty times stronger in mammals, causing death by respiratory paralysis.

Quebrachamine closely resembles aspidospermine.

Aspidosamine closely resembles aspidospermatine on the respiration and muscle fiber, but also paralyses the motor nerve-ends.

Aspidospermine was discovered by Hesse. It is soluble in alcohol, in 106 parts of absolute or 48 parts of 90 per cent ether, 6,000 of water, and easily in benzoin or chloroform. The salts are very soluble. It is very bitter. It forms colorless, hard prisms, or fine acicular crystals. Potassium iodide, Mayer's reagent, potassium-bismuth iodide, bromine, and phosphomolybdenic acid, give white precipitates with very dilute solutions; picric acid with a solution 1-1000; but tannic acid only in concentrated solution. Concentrated sulphuric acid and Frœhde's reagent dissolve aspidospermine without coloring. In diluted perchloric acid it dissolves on heating, with red color.

Physiologic Action.—Small doses by stimulative centric action make the breathing more rapid and deeper, slow the heart and lower temperature. Large doses cause tonic contractions and convulsions. Lethal doses render respiration slow, weak and arrhyth-

mic, death coming from apnea. The heart continues to contract after the breathing ceases. The effect is especially on the medullary centers, as shown by nausea and respiratory changes; and on the spinal cord, as indicated by the convulsions, and increased reflex excitability. The muscular fibers are weakened and finally paralyzed in the frog, but not in mammals. The circulation is weakened by the nausea, and directly by lethal doses (Cushny). Eloy and Huchard noticed diarrhea and diuresis occurring sometimes, and a diminution of the hemoglobin. The venous blood of animals after toxic doses is red, like that of animals killed by bulbar puncture. Penzoldt explained this by attributing to aspidospermine the power of increasing in the red blood cells the capacity of absorbing oxygen, and depriving them of the power of parting with it to the tissues.

While this alkaloid causes nausea in overdoses it does not occasion vomiting, even in excessive doses. It increases the mucous secretion of all the respiratory tract, and also the saliva.

Quebrachine has the formula $C_{21}H_{26}N_2O_3$. It forms delicate acicular crystals, intensely bitter in solutions, almost wholly insoluble in cold water or alcohol, alkalies or ether, and easily in chloroform and in boiling alcohol. It is dextro-gyrate. It gives no color with iron chloride. Boiled in perchloric acid it becomes yellow. A solution in concentrated sulphuric acid becomes bluish in a few minutes; adding potassium bichromate it becomes blue, and finally reddish brown.

Quebrachine is a powerful respiration paralyzer; 0.005 (gr. 1-12) injected intravenously kills a rabbit instantly by respiratory paralysis. In mammals the paralysis is preceded by a brief period of increased irritability, the rate and depth of respiration being increased, and muscular spasms following. In frogs it paralyzes the motor apparatus, first affecting the peripheral respiratory nerves, whereas the other quebracho alkaloids affect the centers (Liebreich). The pulse is slowed to stopping, but only after respiration ceases. In toxic doses the breathing deepens, the rate of respiration being unaltered; the quantity of air inhaled is greater, but the excretion of carbonic acid gas does not correspond. The blood absorbs and retains more oxygen (Penzoldt), the medulla lacks oxygen, and dyspnea results.

Quebrachine also lowers the temperature, even small doses causing a fall of 12 to 14 degrees F. in ten minutes (Eloy and Huchard); at the same time increasing the secretion of urine.

Schiffer found that an extract of quebracho bark caused in a

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mammal (rabbit) muscular weakness, followed by paralysis, with greatly diminished reflex excitability, the deepest narcosis, with rapid breathing, the heart and pupils unaffected. Death was preceded by convulsions. The motor nerve-trunks even before death were almost devoid of functional activity.

Eloy and Huchard found that after removing quebrachine, hypoquebrachine, aspidospermine and aspidospermatine, the residuum had some effect on the sensibility, although the four bodies removed had none, but produced tonic convulsions and reduced the temperature. Aspidospermine greatly excelled the other alkaloids as to the effect on respiration.

We see therefore that the physician who prescribes the extract of quebracho has at his command an agent of undoubted power. It may, if aspidospermatine be predominant, cause respiratory sedation and muscular debility to a certain extent; if quebrachine be the predominant alkaloid he will get twenty times the same effect. If aspidosamine be the principal alkaloid in the sample he secures, he will have in addition to cope with paralysis of the peripheral termini of the motor nerves. Should he be fortunate enough to secure a preparation in which all the foregoing exist in small amount, but aspidospermine is richly present, he will obtain the respiratory stimulation he seeks, with lowered temperature and slower pulse, without any weakening of the heart. He may find the reflex excitability lowered or heightened, as the case may be. Possibly the bowels will be loosened or the urine increased in quantity, but then again nothing of the sort may occur. Maybe it will induce profound narcosis, or drop the temperature 1 to 4 degrees, or affect the sensory nerves. In short, there is a terrifying uncertainty as to what effects are going to follow the administration of quebracho, that is calculated to keep the physician guessing. Probably his best plan after prescribing it is to sit on the fence until summoned, with stomach-pump in hand.

The effects of aspidospermine are distinct, uniform and unvarying; their quality and degree of action can be calculated to a nicety —the effect is certain when the indication is presented.

Therapeutics.—Aspidospermine has been employed for the relief of dyspnea, as occurring in the course of asthma, emphysema and other respiratory maladies. It is less effective in the dyspnea of pulmonary tuberculosis. Harnack asserts, however, that the best quebracho alkaloïd for this purpose is quebrachine.

Eloy and Huchard recommend aspidospermine as an antipyretic

in fevers. Fronde gave it in typhoid fever to lower the temperature and stimulate the lungs. It has proved of service in every form of dyspnea, bronchial, cardiac, nervous, even in that of uremic origin (Wood), as well as in emphysema and in spasmodic croup.

Picot states that taken before hill-climbing, it increases the respiratory endurance.

Its effect in relieving cyanosis is marked (Shoemaker). In a child with double pneumonia, it decidedly improved the breathing and the heart-action (Lawrence).

In acute rheumatism and in serous inflammations, it sedates the pulse and lowers the fever (Shoemaker).

Dosage.—The dose is somewhat doubtful, and Penzoldt says that it must be separately ascertained for every case. As 0.003 (gr. 1-22), hypodermically, causes muscular tremor, it is best to begin with doses of 0.0005 (gr. 1-134) repeated every hour or oftener till the desired effect has been obtained. The dose thus ascertained may be given subsequently at once.

For hypodermic use the chloride is suited by its ready solubility in water. Dose 0.0005 (gr. 1-134), not exceeding 0.002 (gr. 1-33).

Or for hypodermic use dissolve 0.2 of aspidospermine in water 10.0 with the aid of a trace of sulphuric acid, neutralizing if necessary with sodium bicarbonate (Bocquillon-Limousin). The doses given for the commercial aspidospermine cannot be taken as applying to the pure product now employed under that name.

Quebrachine hydrochlorate dissolves easily in hot water and remains in solution on cooling. The average dose is 0.005—0.1 (gr. 1-12—1 1-2) three times daily; or better, 0.001 (gr. 1-67) every hour or oftener until the desired effect is obtained. It is of use in asthma, emphysema, bronchitis with marked nervous irritability and dyspnea, and may be used in affections characterized by hyperpyrexia.

If the physician is not going to delve deeply into the active principles of quebracho he had best content himself with two things, and should so fix them in his mind that they will stick forever. (1) Never use the extract under any circumstances if the alkaloids are attainable. (2) Always use aspidospermine to the exclusion of the others and learn how to use it right, remembering that it relaxes spasm, stimulates the breathing mechanism and slows and steadies the heart, effects desired in all cases of dyspnea; therefore the indication. Give aspidospermine in dyspnea; give it right and you will not be disappointed.

ATROPINE.

Standard granules—Atropine sulph., gr. 1-500, gm. .000125; atropine sulph., gr. 1-250, gm. .00025; atropine valerianate, gr. 1-250, gm. .00025.

Of all the remarkable agents in the wonderful alkalometric armamentarium, none is of greater interest than atropine. The more the science of drug-action is studied the greater is the tendency to lift this powerful alkaloid into the place heretofore occupied by morphine, a monarch who has forfeited his crown by bad behavior.

The group of plants containing atropine has been from the earliest days of the medical art recognized as possessed of powerful influences, for good or evil, over the human body. As poisons the names of deadly night-shade, henbane and death-apple represent the popular idea of belladonna, hyoscyamus and stramonium respectively.

In medical practice they were recommended for about everything in the list, especially for maladies not readily controlled by ordinary agents; but the general repute of the whole group was—unquestioned power but uncertainty of action, and therefore unreliability. They were remedies "to be tried," and that this uncertainty should exist in the case of these ancient remedies, after thousands of years' use, shows well the true status of the science of therapeutics in this, the twentieth century of Christianity; though in truth the use of these drugs antedated the present era by at least twenty centuries more.

We now know that the cause of this uncertainty lay in the varying chemical composition of the plants. Nature is unvarying and in her is no shadow of uncertainty; and the same conditions of sunshine, heat and moisture accomplish the same results, with of course the other influences of soil, competition, etc. And as these conditions vary she produces varying proportions of atropine in each of these plants, and varying proportions of certain other alkaloids as well. She leaves to the enlightened reason of man the task of separating these principles and utilizing their properties.

Belladonna contains atropine with hyoscine, hyoscyamine, atropamine, and belladonnine. Atropine predominates.

Hyoscyamus contains hyoscyamine and hyoscine, with a little atropine. Either may predominate.

Stramonium contains atropine, hyoscyamine and hyoscine.

Duboisia myoporoides contains hyoscine or hyoscyamine and other alkaloids. Another duboisia contains piturine, closely allied to nicotine.

Scopolia contains hyoscyamine, hyoscine and a little atropine.

Mandragora probably contains a mixture of these alkaloids.

The leaves of tobacco and potato contain some of these alkaloids. Decomposing fish and meat contain a ptomaine, ptomatropine, whose effects closely resemble those of atropine.

Not one of these sources supplies any one of these alkaloids without the other, or in unvarying proportions. Belladonna comes nearest to giving a uniform effect, the atropine nearly always predominating.

These agents affect man and the dog easily, while other animals feed upon the plants containing them with impunity.

Atropine was isolated in 1833 by Geiger and Hesse, but Mein had already discovered it in 1831. It crystallizes in prismatic needles. It is soluble in 300 parts of cold water or in 58 parts boiling water, very soluble in alcohol, and this solution is very easily precipitated by a very little water. It is soluble in 35 parts cold ether, 6 of boiling ether, 3 parts chloroform and very easily in amylic alcohol. The salts crystallize with difficulty, and are readily soluble in water or alcohol, very slightly in ether.

Physiologic Action.—Van Renterghem gives the following symptoms, as they appear successively after taking atropine: Dryness of mouth and throat, thirst, disordered vision, paralysis of accommodation, alteration of the voice, aphonia, sense of cold followed by rapid pulse, redness of the face, vertigo, headache, and delirium. If the alkaloid be then discontinued, the symptoms subside in reverse order in 12 hours, except the ocular, which may last longer. Very large doses cause the same symptoms but more accentuated, the stage of excitement short and quickly followed by that of paralysis; deglutition impossible, dysphagia, rabic symptoms, injected conjunctivæ. eyes prominent, face crimson, iris disappeared, furious delirium, ending in complete adynamia, fall of pulse, which had reached 150, lessened heat, respiration difficult, cutaneous anesthesia, paresis, soporous state, convulsions general and partial, retention and then incontinence of urine and feces, weakening and irregularity of the pulse, and death by asphyxia in 3 to 36 hours.

The muscular motor nerve-ends are paralyzed by large doses; as well as the cutaneous sensory nerve-ends, hypodermic injections producing more local anesthesia than morphine. Gubler mentions a case where the patient after a full dose was unable to button his clothes, the tactile sense being abolished and the muscles having lost their power.

While small doses paralyze the intracardiac vagus ends, permitting an enormous rise of the pulse-rate, it is evident that other portions of the heart are influenced by atropine, since it lifts the paralysis caused by chloroform, potash salts, oxalates, cholates, apomorphine, copper, zinc, antimony or quinine (Luchsinger).

Atropine stops the action of glands by a direct influence over the secretory nerve fibers, the vasomotor influence going for nothing.

It arrests the peristaltic movements of the intestine completely when they depend only on the motor nerve-centers (Schmiedeberg). The paralyzant action is best shown when the circular fibers are in spasmodic contraction. This action is exerted on the stomach, spleen, bladder, uterus, bronchi, etc.

Small doses lessen the excitability of the ganglionic system of the intestine, bladder, ureters, uterus, perhaps paralyzing the smooth muscular fibers themselves (Bezold and Bloebaum).

The scarlatiniform redness of the face and upper part of the body may depend on the local vasodilation, or rather on the rapid pulse and rise of blood-pressure (Van Renterghem).

The influence of atropine on the vasomotor nerves explains its antiphlogistic effect. Zeller observed that a solution of atropine sulphate in a neutral solution of sodium chloride dilated the arteries, accelerating the circulation in veins and capillaries not dilated. The passage of white globules into the tissues was checked, the amœboid movement of emigrated cells was lost on contact with atropine, and they became round and opaque.

Atropine exerts its effects markedly on the peripheral nerve-ends, paralyzing the pupil contractors and accommodation apparatus of the eye, the cardiac inhibitory centers connected with the vagus, the intestinal and other unstriped muscular fiber, and the secretory nerves of many glands. Large doses affect the cerebrum causing delirium.

The conjunctiva is most sensitive to atropine, which diffuses itself into the ocular tissues without entering the blood, as one pupil, or even a part of one pupil, may be fully dilated without affecting the other pupil or the rest of that one. The drug affects the ends of the oculo-motor fibers in the muscle-cells of the sphincter. If thoroughly atropinized no direct irritation of the oculo-motor in the cranium will affect the pupil; though if the patient be insulated and a static current applied to any part of the body the iris will contract (Neiswanger). In birds the iris consists of striated muscle fiber, and this is not affected by atropine. To paralyze the accommodation requires larger doses and longer time.

Atropine lessens the number of the leucocytes, and the excretion of uric acid (Horbaczewski).

When atropine is given internally, in doses of 0.001 (gr. 1-67) thrice daily, it affects the eye, the glandular innervation and the motion of organs containing unstriped muscle-fiber, including the heart. In moderate doses atropine abolishes the action of the chorda tympani on the salivary secretion, but not the influence of this nerve over the dilation of blood-vessels, nor the function of the gland-cells. For irritation of the sympathetic has the same effect after the atropine intoxication as before it, the gland-cells secreting thick and scanty saliva (Heidenhain). Physostigmine in large doses, injected into the artery of the gland or its parenchyma, overcomes this paralysis, unless the dose of atropine is overwhelming, and active in the general circulation. All the salivary glands are affected alike by atropine. Minute doses stop the secretion of the mucous glands of the tongue, controlled by the glosso-pharyngeal. The lessened sense of smell is due to the drying up of the nasal mucus-secretion.

On the glands of the digestive apparatus atropine acts less energetically. The secretion of pepsin and hydrochloric acid is checked. The pancreatic secretion is checked, and simultaneously the passage of substances from the stomach into the duodenum completely prevented (Pawlow). Irritation of the vagus excites pancreatic secretion, limited but not entirely stopped by atropine (Pawlow). The increase of pancreatic secretion by muscarine is completely suppressed by atropine, but the stimulation of bile-secretion by muscarine is only lessened by atropine. This would indicate the value of atropine as a remedy for hyperchlorhydria.

The amount of urine and of urea is lessened by intravenous doses of atropine, 0.0015—0.002 (gr. 1-43—1-33) per kilo of body-weight. This decrease is prevented by free ingestion of water, salt and urea.

On the perspiration the effect of atropine is strictly analogous to that on the sweat-glands. Reflex and direct irritation of the secretory nerves are alike useless, even after small doses of atropine (Luchsinger). Pilocarpine or physostigmine applied locally restores the secretion and the irritability of the centrifugal secretory nerves.

It is less certain that atropine directly lessens the secretion of milk and of the respiratory mucosa. The action of this agent on the

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blood-vessels may account for the clinical observations made in this respect, which certainly show a decrease in the secretion.

The nerve-ends in unstriped muscle-fiber are paralyzed by atropine, as those of striated fiber are by carmine. When under the toxic influence of atropine, irritation of the vagus will not produce gastric or intestinal motion. Small doses of atropine stop peristalsis, while large doses directly irritate the intestinal musculature, and even with small doses the previously quiet intestine will begin peristalsis (Liebreich). But exceedingly small doses by paralyzing inhibition facilitate the movement of the bowels (Brunton).

The paralysant dose of atropine varies with different organs. The bladder retains irritability when the œsophagus is paralyzed.

Atropine acts on the circular muscle-fibers of the arteries locally and from the vasomotor centers. Added to the blood supplied an exsected living organ, the current is slowed briefly and then much accelerated, showing the relaxation of the circular arterial muscles. By exciting the vasomotor center the vascular tension is raised. In dogs, after large doses, 0.01 per kilo, the cutaneous vessels dilated while the cerebral vessels contracted, and the arterial tension was raised (Albertini). This central effect is transmitted mainly by the cervical sympathetic, and when this is severed neither dilation nor contraction occurs.

On the heart even small doses paralyze inhibition, the pulse-rate in man increasing. No amount of irritation of the vagus will slow the pulse or stop the heart under atropine. So also dyspnea and irritability lose their effect on the heart. For some unknown reason the heart first slows when a toxic dose—0.005 (gr. 1-12)—of atropine is taken. Yet the slow pulse of muscarine, which stops the heart in diastole, is promptly quickened by atropine; while muscarine is unable, in any dose, to antidote the effects of atropine. Large doses of the latter directly paralyze the muscular fibers of the heart.

On the respiration atropine acts by paralyzing the vagus ends, and slows the breathing. But by its action on the respiratory center it prolongs and deepens the respirations.

On the brain atropine acts as an irritant, in large doses causing excitement, unrest, insomnia, haste in movements and combativeness. In full intoxicant doses it causes hallucinations of sight and hearing, delirium mostly cheerful, erotism, impulse to constant activity, eventuating in convulsions; followed by paretic symptoms, syncope, anesthesia, sopor. Very large doses finally paralyze striated muscle, like curarine.

Some tolerance of atropine may be acquired, but cumulative effects may occur ending in death.

Atropine often causes a rise in temperature, independent of the convulsions and circulatory changes. The heat radiation is increased but the heat-formation still more. This is due to a direct action on the cerebral heat-center (Ott).

Synergists.—The mydriatic group, belladonnine, homatropine, duboisine, daturine, hyoscyamine, mandragorine, all probably forms or compounds of atropine. Among auxiliaries are hydrocyanic acid, a mydriatic, analgesic and cough sedative; quinine as an antiphlogistic; cicutine as a paralyzant of motor nerve-ends, analgesic and mydriatic; morphine, although it contracts the pupil and congests the brain, suspends bronchial and intestinal secretion and calms pain; strychnine raises the general tonicity and augments the debilitated contractility of the longitudinal muscular fibers in cases of mixed paresis and spasm, often present in asthma, dysuria, retention of feces; camphor monobromide as antispasmodic and sexual sedative, in the latter adding gelsemin and cypripedin; quinine and ergotin in combating hyperemia and as oxytocics; camphor, capsicum and glonoin in forcing out retarded eruptions.

Antagonists.—Nicotine is held by some to be synergist, but seems rather an antagonist, as it contracts the pupil, and augments all the secretions, especially the sweat and saliva.

Muscarine excites the parts of the peripheral organs paralyzed by atropine, slows pulse, lowers arterial pressure, increases saliva, tears, sweat, mucous secretions, bile, pancreatic juice, causes contraction of the pupil and spasm of accommodation, tetanic contraction of stomach and intestines, of bladder, spleen and uterus.

Pilocarpine and nicotine possess properties analogous to those of muscarine. The excitation of the peripheric terminations of the inhibitory nerve of the heart produced by these alkaloids is soon followed by paralysis, as the primitive myosis is succeeded by a light mydriasis. Both augment glandular secretion and excite contractions of the stomach and intestines. Atropine prevents or sedates these symptoms.

By its special action on the secretion of the bronchial mucous glands apomorphine is the antipode of atropine. But nevertheless we can serve ourselves with both at once, the apomorphine to diminish the viscosity of the bronchial mucus, the atropine to relax spasm.

Physostigmine, which excites the muscular system of the life of relation as well as that of nutrition, and tends to paralyze the

whole central nervous system, is but illusory as an antagonist. Experimenting on a cat, by giving successively muscarine, atropine and physostigmine, we can cause spasm of the intestine, then complete detention, and again spasm; myosis and accommodation spasm, then pupil-dilatation and accommodation-paralysis, finally again pupillary contraction; the salivation caused by muscarine is arrested by atropine and restored by physostigmine. Probably physostigmine excites the muscular fiber and gland tissue thereby masking or neutralizing the paralysis of the peripheric nerve-ends produced by atropine.

Gelsemin, cicutine and the bromides combat the cerebral hyperemia of atropine.

An exact antagonism of medicinal agents is unknown. One modifies the apparent effect of another by acting on some other part of the bodily mechanism.

Atropine is an effective remedy in poisoning from the fly fungus, Amanita muscaria, or its alkaloid muscarine (Schmiedeberg). In nicotine poisoning the stage of irritation is combated by atropine, but the sudden reversion to paralysis nearly related to that of atropine, suggests caution (Kobert). More important is its antagonism to morphine. The lowering of vascular tension and slowing of respiration caused by morphine are directly antagonized by atropine. Failure may be ascribed to overdosing with atropine, its paralytic effects becoming manifest. But morphine is far from being a counter-poison to atropine.

Children bear atropine much better than adults. Flaxen blonds are extraordinarily liable to its action, even in the smallest doses. Inebriates are apt to become wildly delirious from ordinary medicinal doses, of 0.0005 (gr. 1-134). Idiosyncrasies are common. This remedy should therefore be given in very small doses, repeated quickly till the desired effect is manifest.

Therapeutics.—As a mydriatic atropine has become indispensable to the oculist, from the uniformity, certainty and power of its effects. A solution of 0.06 (gr. j) to 8.0 (two drams) of distilled water is usually prescribed, five drops being applied to the lower conjunctival fold every four hours for two days. This fully dilates the pupil and paralyzes the accommodation.

Homatropine may be preferable as a pupil dilator but cannot replace atropine in the treatment of ocular maladies. A single application, may determine the access of glaucoma, hence the intraocular tension should always be tested before applying atropine. In

superficial inflammations of the cornea with photophobia, especially if complicated with maladies of the iris, atropine acts by arresting the amœboid movement and migration of the while cells, and by preventing, by arterial dilatation and acceleration of the blood-current in the inflamed part, the adhesion of wandering cells to the lining of the capillaries and veins (Binz).

Deep corneal ulcerations threatening perforation, and conditions with increased intraocular pressure, contraindicate the use of atropine. Affections of the iris, however, form the special field for atropine, its instillation being prophylactic. Adhesions due to inflammation can often be prevented; synechiæ rupture by atropine, alone or alternated with physostigmine. Van Renterghem speaks of the improved results secured from the use of atropine when conjoined with the internal use of aconitine, veratrine and digitalin for fever and inflammation, quinine for the access, morphine and croton-chloral for pain, and antidiathetics like mercury iodides, etc., as indicated.

In headache due to eye-strain the local application of atropine to the conjunctiva often affords great relief. In immature cataract and spasm of accommodation, instillations of atropine solution are used with benefit. There is little danger of systemic poisoning from this local use of atropine, except in idiosyncrasies. If the solution is allowed to become alive with microörganisms and is used long, granulation of the eyelids may arise. This is prevented by employing solutions certainly sterile. Some persons are so susceptible to atropine that the skin flushes at the least contact with it. Sometimes the mydriasis persists for months instead of subsiding within a week.

The internal uses of atropine spring primarily from its power of paralyzing the peripheral nerve-ends. The difficulty of sharply differentiating the toxic from the medicinal dose, and the contradictory results, are the reasons this mighty medicament has not attained the notable place it probably deserves (Liebreich).

In painful affections of the skin, mucous membranes and muscles, atropine has been administered with success.

As a muscular relaxant atropine finds employment in spasmodic conditions, sphincter constrictions, spasm of smooth muscular fiber, especially circular, in œsophagismus, cardialgia, colics intestinal, hepatic, renal, uterine, spasm of the neck of the bladder, of the uterus, of the vaginal and urethral orifices, of the anal sphincter.

In all pathologic contractions or excessive activity of non-striated

muscle-fiber, in the tenesmus of dysentery, nocturnal enuresis, the use of atropine is well established; especially in lead-colic, whose phenomena may be completely dissipated by atropine (Harnack). By relieving spasmodic contraction of the muscular coat of the bowel, it relieves obstruction. Hence, in strangulated hernia it has been given with most satisfactory results. Oppenheider gave it in nine cases of obstinate painful constipation from hepatic cancer, peritonitis, etc., and obtained relief from full "toxic" doses. Norman Kerr reported five similar cases, three having fecal vomiting, all successful. It is indicated in all cases of high-grade, persistent constipation, where enemas and saline cathartics fail and drastics cause pain; also where opiates and chloral have been used to relieve pain (Oppenheider). In this category come many cases usually ranked as appendicitis of the catarrhal form, and obstructions following the ingestion of indigestible food, such as berries, in very large quantities. Too many of these are subjected to the knife, too many die after the action of violent cathartics; but such cases yield readily when brought under the influence of atropine, with hot colonic flushing and saline laxatives.

Rarely do these states depend on one morbid factor alone; so that with atropine we associate strychnine or brucine as general incitants, morphine and cicutine to subdue nervous hyperesthesia, and among other agents in combating various phenomena.

In the convulsive stage of whooping-cough, in spasmodic asthma, and all irritative coughs, atropine prevents the spasm. It finds application as an antispasmodic in dysmenorrhea, uncontrollable vomiting, volvulus, invagination and strangulated hernia.

In all these atropine requires the aid of modifiers: Calcium sulphide, apomorphine, and quinine hydroferrocyanate in whooping-cough; strychnine and arsenic in asthma; ergotin, iron, quinine, strychnine, in dysmenorrhea; brucine, strychnine, morphine for vomiting; strychnine for intestinal strangulation.

Atropine serves well for constipation or for diarrhea. By relaxing intestinal spasm it reëstablishes the regularity of the evacuations; by arresting exaggerated peristalsis and glandular secretion it arrests intestinal fluxes.

The property of moderating secretion has been utilized in the night-sweats of phthisis, exaggerated salivation, bronchorrhea, diarrheas, and some claim, in lactorrhea. Ebstein obtained good results in the salivation of a hemiplegic. In phthisis atropine combats the sweats, the diarrhea and the cough. In bronchorrhea it calms

the cough, lessens the reflex irritability of the mucosa, checks the hyper-secretion and acts as an antispasmodic. In incontinence of urine it lessens the hyperesthesia of the vesical mucosa. It subdues the irritability of the uro-genital mucosa in spermatorrhea.

In the choleras, Asiatic, infantile and morbus, Brunton had pointed out how exactly atropine antagonized the pneumogastric irritation constituting the disease, and Hankin first proved the truth of the deduction by using atropine in Asiatic cholera with remarkable success. In cholera infantum a hypodermic of atropine, suited to the age, gives speedy relief; but should not be relied upon to the neglect of intestinal antisepsis.

Its sensory-paretic action renders it of value in neuralgias and in some neuroses; trigeminal, odontalgia, otalgia, sciatica, epilepsy, chorea; in neuralgia, combining with morphine, strychnine, quinine, aconitine; in chorea with salicylates, arsenates, vermifuges, strychnine, brucine; in epilepsy with glonoin, cicutine, verbenin.

Atropine valerianate has been recommended in epilepsy by Schroeder, van der Kolk and many others; but not in *grand mal* due to sexual excitation.

In eclampsia and hysteric spasms it has been administered with varying results. When glonoin is given in the first stage of epileptic spasms to dilate the cutaneous vessels, atropine should be added to prolong the effect.

Of late atropine has been very largely used to supplant opium as a remedy for pain. So many varieties of pain are amenable to atropine, and the danger of forming an atropine habit being absolutely *nil*, the tendency is to be favored. In neuralgias, the pallid, shrunken skin, contracted pupil, weak, repressed pulse, are directly antagonized by atropine, which recalls the blood to the surface and relieves the internal congestions. In spasmodic pains of every description, atropine is also the direct physiologic remedy.

In hemorrhages of every variety atropine has proved one of the most powerful hemostatics. A full dose should be given at once, hypodermically, enough to flush the skin. If the blood be withdrawn from the bleeding vessels to the skin it is necessarily out of danger.

Many persons can break up a commencing acute catarrh by taking a full dose of atropine.

In combating morphine poisoning atropine should be given in doses of 0.002 (gr. 1-30) repeated hourly until symptoms of atropine are manifest, such as dry mouth, reddening face, bright

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eyes, dilating pupils. Beyond the beginning of toxic action it is unsafe to go, especially as the antidotal effects of atropine do not cover the entire range of action of morphine. And in poisoning by the galenic preparations of opium it is well to remember that the convulsant effects of atropine may be aided by an unusual proportion of the tetanisant alkaloids of opium, thebaine, laudanine, etc. The cardiac and respiratory depression of opiates is antidoted by atropine, and its use is to be directed solely against these features of opium poisoning, by no means against the somnolence.

Atropine is indicated in the cerebral inflammations with retarded pulse, and in eruptive fevers with delayed eruption and evidences of a nervous system overwhelmed by the onset of the malady.

In grave collapse in any form of narcotic poisoning its property of allaying the excitability of the cardiac vagus extremities can be utilized.

As an oxytocic atropine may be employed alone or combined with ergotin, strychnine or macrotin.

Administration.—It is in all cases best to administer atropine by the intensive method. The dosimetric granules are all too large for accurate dosage. One containing gr. 1-1000 would be preferable. Of these one may be given to an adult, best in solution, every five to twenty minutes, according to the urgency of the case, until the first evidence of action is manifest. This is almost invariably dryness of the mouth; only exceptionally do any of the classic symptoms precede this. When this dryness is felt it is time to stop the drug, as the full benefit has been secured, and if full relief has not ensued, some other remedy is needed, or surgical intervention. This does not apply in poisoning cases.

Children bear atropine well, in larger doses proportionally than adults, but not all children. Double the dosage by Shaller's rule with all but flaxen blondes, and halve it with them.

When the dose for a patient has been determined with accuracy this may be given with advantage at once, especially when dealing with neuralgias and neuroses, where it is an advantage to deal a staggering blow to the malady at the outset, and timid medication will fail. So in urgent cases, cholera, colics, etc., it may be best to give a full dose at once.

Van Renterghem's advice as to adjuvants and combinations, given above, can be largely extended, by adding each other remedy indicated in each particular case. Obviously, we can only supply

the ingredients and general directions. Whether the cake will turn out satisfactorily must depend on the cook.

Liniments containing atropine are usefully applied to the soles of the feet in hyperidrosis. Atropine represses the secretion of milk when applied to the breast. The local uses of atropine are as legitimate in liniments and plasters as in solutions applied to the eye.

Atropine is rapidly excreted by the kidneys. It enters the milk and the fetal circulation, and should not be given to a nursing mother.

In poisoning by atropine, the convulsions may be controlled by ether, the heart and respiration sustained by caffeine. Recovery is the rule.

Death has resulted from the use of 0.12 (gr. 1 5-6) of atropine internally, and in the case of a consumptive, of only 0.04 (gr. 2-3).

Appended is a list of maladies in some phases of which atropine has proved of benefit:

Therapeutic Summary.—Abortion: Increases uterine contractions and checks hemorrhage.

Abscess: Apply locally to abort by vasodilation, and relieve pain.

Acidity: Checks hyperchlorhydria.

Acne: For greasy skin with free sweating.

Adenitis: Locally, relieves pain and favors resolution.

After-pains: Steady contraction relieves pain.

Alcoholism: The basis of all secret cures; the fullness of the head which it causes renders the liquor effect disagreeable.

Aphonia: The hysteric form has been relieved by full doses.

Asthma: When the skin is cool and moist, sputa loose.

Bladder, Irritable: Sedates irritability, checks nocturnal enuresis.

Boils: Applied in plaster, relieves pain and hastens maturation.

Bronchitis: To check profuse mucous flow, bronchorrhea, to relieve irritative cough.

Calculi, Biliary: To relax spasm of ducts and let stone pass, easing pain.

Calculi, Renal: To relax spasm of ureter and allow stone to pass.

Cataract: Immature forms benefited by instillations.

Catarrh, Acute Nasal: To abort the attack and dry up secretion.

Cerebral Anemia: To increase temporarily cerebral blood-supply.

Cerebral Congestion: For less active forms of hyperemia.

Cholera Asiatica: Directly opposes the vagus irritation indicated by symptoms, for cramps, pain, diarrhea.

Cholera Infantum: Same as preceding.

Cholera Morbus: Same as preceding.

Chordee: Relieves all but febrile cases.

Chorea: For cerebral anemia, as antispasmodic, as hypnotic in small dose.

Colic, Intestinal: Relieves spasm, pain, constipation.

Colic, Lead: The best remedy for pain, spasm, obstruction.

Constipation: Small doses paralyze inhibition, allay spasm.

Convulsions: For congestive, teething or whooping-cough forms.

Cough: Spasmodic, nervous, sympathetic, asthmatic, allays irritation.

Croup: Relieves irritation and stimulates respiration.

Cystitis: Relieves irritability, breaks attacks due to catching cold.

Delirium: Relieves that of cerebral anemia.

Delirium Tremens: For insomnia with cyanosis, cold skin, coma vigil.

Dementia: Stimulates cerebral circulation, relieves insomnia.

Dengue: For sweating stage, when excessive or weakening.

Dentition: For the convulsions.

Diabetes Insipidus: Checks excessive flow.

Diarrhea: Checks excessive flow, choleraic, colliquative, irritative.

Diphtheria: Given early, aborts exudation, later to sustain heart, when throat and tonsils are acutely inflamed and swollen.

Dysmenorrhea: For spasmodic or neuralgic cases, dark fetid discharge, crampy pains and chills.

Dyspepsia: To relieve constipation and gastralgia, check hyperchlorhydria.

Dyspnea: Relaxes spasm.

Dysuria: For strangury, bloody urine.

Eczema: For eczema of the hand.

Emissions: For atony and relaxation of genitals, both sexes.

Emphysema: Relieves the dyspnea.

Enuresis: Nocturnal, of children, full dose at bedtime.

Epilepsy: For nocturnal, too sound sleepers, *petit mal,* to dissipate cerebral anemia of first stage.

Erections: Are strengthened by full doses and fear allayed.

Erysipelas: Superficial non-vesicular forms, adynamic phlegmonous or cerebral.

Erythema: To wind up protracted attacks.

Eye Affections: Especially for iris maladies.

Feet: For fetid perspiration.

Fevers: For delayed eruptions, insomnia and low delirium, photophobia, hebetude, hemorrhages, to sustain heart.

Gastralgia: To relieve neuralgic pain.

Gastric ulcer: To stop pain and vomiting, check acid production.

Glottis, Œdema: It may prove capable of drying up the effusion.

Gout: Very effective in relieving pain of gout of stomach.

Hay Fever: By drying up the secretion gives temporary relief.

Headache: Breaks up attacks of excessive meat-eaters. For pain over eye, photophobia, intolerant of noise or motion, uterine, gastric, in young women; face pale and skin shrunk, pulse small and contracted.

Heart disease: For irregular rhythm, cardiac strain.

Hematemesis: Full doses stop bleeding.

Hemoptysis: In full doses probably the best, strongest and quickest.

Hemophilia: Success reported recently in checking hemorrhages.

Hemorrhage, Rectal: Has been highly recommended.

Hemorrhage, Puerperal: The quickest, strongest, best hemostatic.

Hemorrhoids: To stop bleeding and relax spasmodic sphincter.

Hernia: To relax strangulation, full doses.

Herpes Zoster: To relieve pain.

Hiccough: Full doses, to relieve spasm, with strychnine to steady nerve.

Hypochondria: For cerebral anemia, general relaxation, sexual atony.

Hysteria: For convulsions, aphonia, puerperal forms.

Impotence: To strengthen erections and relieve nervous dread.

Influenza: For headache, acute attacks, free sweating or other discharges.

Insomnia: For prostration, low arterial tension, contracted pupils, frontal headache, over-use of eyes.

Intestinal Obstructions: Full doses to relax spasm and relieve pain.

Iritis: Dilate the pupil fully, by local or general use.

Keratitis: If ocular tension be low, contracts vessels, limits inflammation.

Labor: Stimulates uterine contractions, lessens pain and bleeding.

Lactation: Checks flow of milk. Affects nursling.

Laryngismus Stridulus: Cuts short the paroxysm.

Locomotor Ataxia: Recommended by Brown-Sequard.

Lumbago: A hypodermic relieves acute attacks.

Mania: Allays irritation, induces sleep, quiets delirium, for nymphomania, hypochondria, delusions or persecution, whenever it is desirable to stimulate the cerebral circulation.

Mastitis: Relieves congestion and dries up milk.

Measles: Depression of vital powers, low temperature, delayed eruption.

Melancholy: For constipation and low arterial tension.

Menorrhagia: The best of the hemostatics.

Myalgia: Hypodermic to abort acute attacks.

Myelitis: For traumatic cases and anemic conditions.

Nephritis: For irritation and pain in kidneys in acute form.

Neuralgia: Full dose at once to break up attack. Sciatica, lumbago, uterine, ovarian, intercostal, dysmenorrheal, tic, spinal irritation.

Obesity: To check excessive sweating.

Oesophagismus: To relax spasm, ease irritable stricture or ulcer.

Orchitis: As soon as the acute symptoms subside.

Otalgia: For children, with coryza.

Otitis: To relieve pain.

Ovarian Neuralgia: The best remedy, says Waring.

Paralysis: For chronic myelitic paresis.

Perspiration: For phthisis, debility, relaxation of weak children.

Pertussis: To abort attack in incubation, check spasm and secretion.

Pharyngitis: Relieves pain and fever, aborts attack.

Photophobia: Dilate the pupil.

Phthisis: For colliquative sweats, diarrhea or bronchorrhea, irritative cough, dyspnea.

Pleurodynia: For all but rheumatic or uterine forms.

Pneumonia: In the first stage, infants, to check secretion.

Prostatorrhea: To check discharge and subdue irritability.

Pruritus: For obstinate cases and those due to sweating.

Rectal ulcer: Relieves pain, especially burning after stools.

Rheumatism: Excessive sweating may demand atropine.

Roseola: For the sore throat and sweating, delayed eruption.

Scarlatina: To bring out delayed eruption, for sore throat.

Sciatica: Hypodermic down to sciatic notch.

Scurvy: For excessive salivation or relaxation.

Sea-sickness: Empty bowels and bring under atropine to prevent attack.

Sneezing: Dries up secretion and allays irritability.

Spasm: For local muscular spasm, sphincter, hysteric, anemic, teething.

Spermatorrhea: For relaxed genitals, nocturnal emissions, no orgasm.

Sunstroke: For heat exhaustion, all cases with low arterial tension.

Syncope: Glonoin at once, atropine to prolong cerebral hyperemia.

Tetanus: Injected near wound has cured.

Tonsillitis: With aconitine used early will abort attack.

Trismus: Inject into affected muscle.

Typhoid Fever: Contracted pupils, low muttering delirium, weak heart.

Ulcers: Has remarkably favorable influence over their course.

Urticaria: Gives temporary relief.

Variola: Low muttering delirium, prostration, delayed eruption danger.

Vomiting: Relieves that of pregnancy, if neurotic.

This list merely comprises some uses of atropine that are well known to every practician. Many others will suggest themselves to our readers, and of equal importance with the foregoing. In truth, it is doubtful if any other single drug does as many things as this, and does them as well.

AVENINE.

Standard granules—Gr. 1-67, gm. .001 of the alkaloid; gr. 1-6, gm. .01 of the concentration.

Merck lists avenine, an alkaloid found in small proportion in the common oat. Avenin is a body resembling legumin, containing 17 parts of nitrogen to one of oxygen. The entire plant is crushed to a pulp when the grain is in the milk, and treated with strong alcohol.

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Avenin was introduced by Benjamin Keith, as a remedy for paralysis. He had suffered from this and found no remedy that proved of benefit until he tried avenin. He firmly believed in the efficacy of avenin and advocated it energetically. The writer prescribed avenin for a man who had had a stroke of hemiplegia some years previously. The patient took the remedy two weeks, and reported no effects. In two weeks more he believed it was doing him some good. At the end of another fortnight he was sure of it, and continued to take the avenin for a year, firmly convinced of its usefulness. And this has been the general result of the writer's use of avenin in similar cases, though not without exception. Just wherein the benefit lay is unknown—the patients are sure of it, and prize the remedy, finding it a comfort and their unpleasant sensations relieved.

Avenin has been recommended as a remedy to ease the alcohol or morphine habitue to cease the use of his drugs. The writer has tried avenine, avenin and Keith's tincture in alcohol and morphine cases, and found some benefited but the majority obtained no benefit. It is worth trying, and generally forms an ingredient of the tonics used for this purpose.

Sometimes persons not ill complain of feeling languid and unrefreshed on rising in the morning. A small dose of avenine, five granules, in a glass of hot water on going to bed, will be followed by a sound sleep and a sense of rest and strength next morning.

King gives as the specific indications for avenine: Spasmodic and nervous disorders, with exhaustion; cardiac weakness; nervous debility of convalescence; spermatorrhea from the nervous erethism of debility; tensive articular swellings. A nerve tonic, stimulant and antispasmodic.

BAPTISIN.

Standard granule—Gr. 1-12, gm. .005.

From the root of Baptisia tinctoria, wild indigo, are derived baptisin, baptin and baptitoxine. Schroeder pronounced the first and second inert, and his verdict has been generally accepted. He found baptitoxine tonic in small doses, highly toxic in large, hastening the respiration, exaggerating the excitomotor power and causing death by asphyxia.

Plugge claims that baptitoxine is identical with cytisine, ulexine and sophorine. Kobert found the symptoms of cytisine resembling those of strychnine somewhat, but with vomiting of centric origin;

cytisine depresses the ozonizing property of the red blood corpuscles during life; it excites and then paralyzes the respiratory center; powerfully stimulates the vasomotor centers, producing marked elevation of blood-pressure independent of the heart, followed (after large doses) by fall of pressure from vasomotor center paralysis The motor tract of the spinal cord is strongly excited by small doses, paralyzed by large ones. The peripheral ends of the motor nerves are paralyzed as with curarine. Cytisine also stimulates the uterine muscle and has often produced abortion.

Cytisine has also been recommended for paretic migraine and cardiac dropsy, mucous irritability, nervous dyspepsia, restlessness from mental overwork, and frequent vomiting from slight excitation.

Specific Indications.—Ellingwood calls baptisin a bitter glucoside, baptin a purgative glucoside, and baptitoxine a toxic alkaloid. Specific indications for baptisia are: Mucosa of mouth dark, purplish; tongue, dry and thin with dark coating; face dusky and suffused; circulation feeble. It has a dynamic influence on the intestinal glands, antagonizing disease influences there, reinforcing the blood, preventing destruction of the red corpuscles and stimulating the removal of debris. In malignant tonsillitis and diphtheritic croup, and in phagedena tending to gangrene, it has proved curative. It is useful in dysentery with offensive breath and prune-juice stools; and in scarlet fever, when the specific indications above-described are present. In low fevers baptisia sedates the fever markedly, and soothes cerebral excitement.

Scudder gives as indications for baptisia: face full, dusky, purplish red, like one who has been in the cold for a long time; tongue the same dusky, purplish color; headache dull, pulse oppressed. This condition is met in zymotic and other maladies. The pulse is fast, fever high, the ordinary sedatives and baths do not have their usual effects. The pulse and fever fall under baptisia. Continued, scarlet and typhoid remittent fevers, dysentery and diarrhea, furnish indications, often on the first day. When gastrointestinal inflammations tend to necrosis or gangrene, baptisia enjoys high repute. It is a useful gargle in similar throat diseases, the malignant forms of scarlatinous, variolous, diphtheritic and mercurial sore throat, and ulceration. Topically it is also applied to syphilitic ulcers, white swellings, "fever sores;" phagedenic, foul, fetid and gangrenous ulcers, sore nipples, chronic and scrofulous ophthalmia, fetid leucorrhea and genital ulcers. It is a local tonic and excitant to the vessels

and tissues. It should be given internally at the same time. Cloths saturated with a strong decoction should be applied to the abdomen.

Webster terms baptisia a dynamic antiseptic and antizymotic, not acting chemically but by stimulating the vital functions. This is especially true of the intestinal glands, and also of the blood in septic and epidemic maladies. It is also useful whenever there is a tendency to gangrene. Prune-juice expectoration in pneumonia is an indication. He reports a case of ischio-rectal cellulitis with gangrene and systemic toxemia, recovering under baptisia and rhus tox.

Merck lists Baptisin, pure, purgative in large doses, tonic-astringent in small; dose 0.032—0.3. Also Baptisin (Eclectic), dose 0.05—0.52.

Brunton classifies baptisin as a hepatic stimulant of secondary power, and says it also stimulates intestinal peristalsis.

Bocquillon-Limousin says baptisin is used for erysipelas and affections of the liver.

Liebreich says baptisia is employed as a protective against horse-flies.

The conflicting reports as to the effects of baptisia are probably due to varying proportions of the three diversely endowed active principles. Among the Eclectics, not only the three authors quoted, but numerous magazine articles, there is a remarkable unanimity as to the value of this plant and the uses to which it is put. It must be noted that by them it is invariably used in small doses, from one-fourth to five minims of the specific tincture, which corresponds to the fluid extract in strength.

The conditions in which baptisia is used are those in which the vital powers are overwhelmed by septic poisons, either in the whole body or, more commonly, in a part. Hence, when reaction appears deficient, when the systemic powers are not able unassisted to throw off the disease, and death of the whole or a part is impending, baptisia is prescribed with the utmost confidence. The action, therefore, is analogous to that of capsicum or sanguinarine in pharyngitis.

It will be time enough to deny the possibility of such an action when we know just what constitutes vitality, and the laws that govern it. Meanwhile, the important question is simply whether these assertions are founded on fact. Sometimes a man makes an observation—certain phenomena present, a drug is given, and recovery ensues. He credits the drug with the cure, and many other physicians employ it in similar cases. Successes are reported, fail-

ures are not. And so the repute of the drug as a remedy is made—and yet the whole sequence was coincidental, not consequential; and an error is engrafted on medical practice, that may cost hundreds of mistakes and many lives before it is detected and expelled.

On the other hand, the presumption in such cases is in favor of a principle whose correctness is attested by many men. I have been unable to find in my therapeutic library any record of a real trial given by the regular medical school to baptisia; nothing but the distrusting, slighting tests, ready to accept the slightest excuse for dismissing with contempt, usually accorded remedies emanating from irregular sources. If the drug really possesses the properties claimed, it will be indeed a valuable addition to our resources. In baptisin we have a useful bitter tonic resembling quassin, in baptin a cholagogue, one of these also stimulating peristalsis. Baptitoxine is probably the most important ingredient, to which the vital incitation is to be attributed. It would be interesting to note the effect of this upon the leucocytes. Whether depression of the ozonizing capacity of the red blood corpuscles interferes with bacterial operations, is a question for the future; but there can be little doubt but that the powerful stimulation of the vasomotor centers is beneficial when vital depression threatens life. The spinal motor excitation also has its use. It is also noteworthy that the vasomotor excitation is altogether independent of the heart.

While baptisia is ranked by the eclectics among the antiseptics, the action is radically different from that of the chemical disinfectants. Baptisia enhances the vitality of tissues threatened with destruction, enabling them to resist the tendency to death. So far as we know this claim has not been made for any other remedy except echinacea. If true, we have in baptisia an agent whose value could scarcely be overestimated. Its field would include all the maladies in which there is an overwhelming of the vital forces by disease causes, "germs," including erysipelas, diphtheria, typhoid fever, smallpox, scarlet fever, measles, phagedena, dysentery, cerebro-spinal meningitis, all affections characterized by ulceration or suppuration, or gangrene. Webster suggests its use in mania, melancholia and dementia, with stupor, and all affections with drowsiness or typhoid states.

BARIUM CHLORIDE.

Standard granule—Gr. 1-6, gm. .01.

The salts of barium were popular a century ago as remedies for scrofula, syphilis, heart-diseases and aneurism. In Italy they are

given in chorea major and tetanus. Brown-Sequard recommended them for paralysis agitans.

Physiologic Action.—Barium chloride stimulates the intestinal motor ganglia, causing powerful peristalsis, even cramps, choking, dysenteric stools and vomiting. The blood-pressure is increased by contraction of peripheral vessels, then falls below normal. The pulse is first rapid and irregular, then slows; ending with heart-paralysis and asphyxia. Respiration is labored. Tinnitus, diplopia, cramps from irritation of the medulla, and paralyses, show the effect on the nervous system. Autopsies show inflammation and ecchymoses in the stomach and bowels. Barium was detected in the blood, urine, spleen, liver and kidneys. The fatal dose for man is from 4.0 to 10.0 (1 to 2½ drams). Death does not occur for several days.

Cushny says that in lethal doses barium chloride stimulates the spinal cord and the medulla, causing violent tonic and clonic convulsions. It causes very active peristalsis, and increases the blood-pressure enormously. The effect on the heart muscle is antagonized by potash. Barium is partly stored in the bones, partly excreted in the urine and the feces.

When used in medicinal doses for prolonged periods, chronic toxic symptoms may occur, nausea, diarrhea, catarrhs, cardiac and nervous depression. Barium seems better tolerated in hot climates. In the north daily doses of 0.3 (gr. v) have caused unpleasant symptoms.

The dose of barium chloride has been fixed at gr. 1-6 repeated every hour till the desired effect has been obtained. This is better than the doses recommended by the text-books, which are so varied as to indicate considerable variation in the purity and strength of the specimens found in the shops. The dose of barium chloride usually given is 0.03 to 0.12 (gr. ½ to 2), three times a day.

Toxicology.—Barium carbonate is used as a rat poison. It is converted into the chloride in the stomach.

In poisoning with barium, empty the stomach by emetics and lavage, and give sodium or magnesium sulphate in large doses, to form the insoluble barium sulphate. Sustain the heart with cardiac tonics. Ogier and Socquet reported a case of death in five hours from swallowing 20 grams.

Therapeutics.—Liebreich pronounces barium valueless in sclerosis of the nerve centers. Barium sulphate is an ingredient of depilatory powders.

Brunton and Hare recommend the chloride as a rapidly acting heart-stimulant, steadying the rhythm and increasing the volume and force of the systole.

Epstein has given it in hypertrophy of the heart with abdominal aneurism, with excellent results.

Barium chloride has been especially studied by Hare. He finds that it slows the heart, steadies the rhythm, increases the quantity of blood propelled by each systole, and raises the arterial pressure by acting on the muscular coats of the blood-vessels. In toxic doses it causes overstimulation, with systolic contractions, the vagi not being paralyzed but overcome by the powerful cardiac contraction. He advocates this agent in all forms of failure of the cardiac muscle, and in varicose veins, the muscle-stimulation extending to the veins as well as the arteries. Barium does not cause the tense pulse of digitalis, the pulse-wave being more prolonged.

BAROSMIN.

Standard granule—Gr. 1-6, gm. .01.

Barosmin is a resin derived from buchu. This plant has had quite a reputation as a remedy for chronic inflammations of the genitourinary tract. Irritability of the bladder, uric acid deposits, chronic urethritis, the incontinence of diseased prostate, especially profuse mucous or mucopurulent discharge with vesicorenal irritation (Felter-Lloyd).

It is indicated when the irritation depends on altered secretion from the urethral glands. Acid urine, incessant calls to empty the bladder with little relief, call for barosmin. Catarrh of the bladder from extension of gonorrhea, from irritant injections, is relieved by it. For this, and for long standing irritability with difficulty in restraining the flow of urine, Lloyd recommends buchu and iron. He gives as specific indications for buchu: Abnormally acid urine, with constant desire to urinate, little relief following; vesicorenal irritation; copious mucous or mucopurulent discharges; cystorrhea.

The uses of barosmin are amply fulfilled by arbutin.

BEBEERINE.

Standard granule—Gr. 1-6, gm. .01.

From the Nectandra, Pareira, Boxwood, Cissampelos and other plants, are derived alkaloids that are believed to be identical, and

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represented by bebeerine. This is extracted by a process similar to that for extracting quinine. It occurs in yellowish amorphous masses, slightly soluble in water, freely in dilute acids, in five parts absolute alcohol or in thirteen parts of ether. The sulphate as found commercially is very impure, containing about one-third by weight of the alkaloid (King). It is found in reddish-brown scales, soluble in water or in alcohol.

In its effects bebeerine closely resembles quinine. In small doses it is tonic, and in large ones antimalarial. It is antiseptic along the same lines, stopping the movements of the leucocytes and of lower organisms. It increases the appetite, relaxes the pulse a little, and in large doses causes ringing of the ears and cerebral fullness, quite as quinine does.

Therapeutics.—In malarial fevers bebeerine is useful but not equal to quinine. It has been praised in periodic headaches and neuralgias; especially in strumous and phthisical patients. It has proved effective in stopping the exhausting sweats of consumption. King recommends it for strumous ophthalmia, and as a useful tonic during pregnancy. Scudder praises it as a remedy for menorrhagia, when the flow is too frequent and too free. In leucorrhea also the tonic effect has been found equal to that of berberine. The dose as a tonic is gr. 1-12 to j, before meals; as a febrifuge and antiperiodic gr. v—xx. Boxwood has been used as an adjuvant to antisyphilitic mixtures, and with doubtful indication in epilepsy. In chorea, hysteria and chronic rheumatism its tissue-toning property may be of advantage. Berberine approaches most closely in action to bebeerine which seems to stand between berberine and quinine. In this day of accurate study of remedial agents, it should be ascertained if malarial spleens are contracted as well or better by bebeerine than by the hydrastis alkaloid. In convalescence from malaria, and when quinine has not agreed or has lost its effect, bebeerine seems to be the logical substitute.

BENZOIC ACID.

Standard granule—Gr. 1-67, gm. .001.

Benzoic acid is obtained from Benzoin as a rule or made artificially from Toluol. Benzoin, a balsamic resin obtained from Styrax benzoin, a tree indigenous to Java and Sumatra, is sufficiently common and inexpensive to render it undesirable to attempt sophistication to any great extent, and thus the larger part

of the benzoic acid on the market—especially if prepared by a firm of repute—is the genuine product. As a matter of fact the artificial acid seems to answer every purpose though there is a great difference in the clinical results obtained from a number of samples. This perhaps is one reason for the widely differing opinions expressed by clinicians as to the value of this remedy.

Benzoic acid is found in many plants, free or combined with bases. It is also obtained from urine but it is impossible to obtain it so pure as to have no urinous odor. It may be obtained by oxidation from cinnamic acid, oil of bitter almonds, cymol, naphthalin, casein, glue, and other organic substances.

It forms loose, shining, yellowish or white crystalline needles or plates, of aromatic odor, sweetish taste, followed by sharp, rasping. It is irritant if inhaled. The acid is soluble in 370 parts of cold and 20 of boiling water, in 7 of chloroform, 2 of alcohol, and 3 of ether, 10 of glycerin, carbon disulphide, and in turpentine, evaporating in steam. Borax or sodium phosphate increase the solubility in water. It must be free from cinnamic acid, which when oxidized with potassium permanganate exhales the odor of bitter almonds.

Physiologic Action.—When benzoic acid passes through the body, it takes up amidoacetic acid, or glycocoll, and appears in the urine as hippuric acid. This takes place only under normal conditions of the kidneys; when they are disturbed benzoic acid passes unchanged. Part is eliminated by the lungs and the saliva in the form of benzoates and succinates.

Benzoic acid as an antiferment and antiputrefactive agent acts more powerfully than salicylic acid in some fluids, such as beerwort and putrefying flesh solution. This is because benzoic acid is more loosely combined with alkalies and more easily set free (Kolbe). One-tenth of one per cent of benzoic acid delays the development of bacteria in a nutrient fluid, and two-hundredths of one per cent hinders it. The propagation of bacteria is prevented by 3 to 4 per 1,000 of benzoic acid (Bucholtz).

In man benzoic acid traverses the body in combination with alkalies, appearing free only in the urine. In the dog benzoic acid increases considerably the dissolution of albumin, without hippuric acid. If the doses are very large a reducing substance is formed, showing the body to be super-saturated, when the drug must be discontinued (Salkowski). Given internally in large doses to animals it produces paralysis, great lowering of temperature,

pulse and respiration at first faster, then slower, with death from respiratory paralysis. It is more irritant to the mucosa than salicylic acid, and in large doses causes nausea and vomiting.

It is used as a dressing for wounds, as an inhalant in pulmonary gangrene and putrid bronchitis, and in cigarettes in asthma, chronic bronchitis and laryngitis. Twenty drops of tr. benzoin in a pint of boiling water makes a good inhalation.

Frerichs urged benzoic acid in uremia, assuming that the ammonia developed from urea is neutralized and rendered harmless by this acid. This theory has not been confirmed by clinical observation (Penzoldt). Basing his recommendation on the antiseptic qualities of benzoic acid, and attributing the therapeutic efficacy of salicylic acid to this property, Senator advised sodium benzoate in acute inflammatory rheumatism, especially when salicylic acid fails or disagrees. He advised the prolonged use of the remedy in large doses.

Benzoic acid has also been given in puerperal fever, gout and cholera infantum. Haberkorn urged it in scarlatina and erysipelas, but experience has not confirmed this use.

In pneumonia of the aged benzoic acid 0.1—0.5 (gr. 1½—7½) is given with camphor, several times a day, and even up to ten grams a day without harm (Liebreich). Iron benzoate is soluble in cod-liver oil, and is sometimes given in it.

Synergists.—As antizymotics, salicylic acid, carbolic acid, resorcin, the aromatics, thymol, volatile oils; while alkalies render the acid soluble and thus favor its passage into the blood.

Antagonists.—There are none; but acids and tannic astringents hinder the absorption of benzoic acid.

Therapeutics.—Van Renterghem thinks benzoic acid of advantage in asthenic pneumonias, chronic bronchitis and whooping-cough, as a stimulant expectorant.

In uremia, dropsies and eclampsias it stimulates the elimination of waste. While Huesemann does not accept Frerich's view as to the action of benzoic acid upon ammonia, he finds clinically that the acid is useful in nephritis. In conjunction with potassium acetate and chloroform the writer has employed this acid in desquamative nephritis, acute and chronic, for many years, with gratifying results. In fact, with the exclusive skim-milk diet, it has taught him to look upon this as a curable malady in the great majority of cases.

For fetid ammoniacal urine in cystitis, Van Renterghem finds benzoic [illegible] ferior to boric acid. Burggræve employed

benzoic acid because uric acid is replaced by hippuric acid, whose bases form in the blood extremely soluble salts. In grave pyrexias it is the alkalinity of the blood especially that it is necessary to destroy, since this is the cause of the ataxy that characterizes these affections. In all these cases benzoic acid fulfills but a part of the indications; the alkaloids must be added as indicated.

Van Renterghem finds doses of three or four milligrams (gr. 1-20 to 1-15) sufficient to obtain the benefit. In respiratory affections he combines strychnine arsenate or brucine; in grave fevers, typhoid, typhus, acute uremia, he has recourse to the defervescents, quinine, intestinal lavage with neutral magnesia salts; in chronic uremia, special modifications as the symptoms indicate.

In chronic uremia, Burggræve said: "Amblyopia may cause suppression of vision, from subretinal œdema; give phosphoric acid, strychnine sulphate, quinine hydroferrocyanate, a granule each, together, every hour. Retinal hemorrhage is distinguished by the ophthalmoscope. Observe if the pupils preserve their contractility; this distinguishes symptomatic from organic amaurosis, and prevents useless treatment and false hopes.. Tinnitus, etc., depend on dryness of the internal ear membranes. Deafness shows œdema of the auditory ossicles, causing vertigo, incoördination of motion, and hemicrania. The same means are indicated as in amblyopia. Convulsions, usually clonic, are due to cerebral anemia or hyperemia. They are epileptiform, and preceded by an aura. The treatment varies as there is softening or sclerosis of the spinal cord. In hydremic epilepsy give iron and strychnine arsenates, and digitalin, together, of each three granules a day. The bromides are not indicated in acute spasms. In uremia there exist often intolerable pains in the members and joints, relieved by morphine and hyoscyamine, of each a granule, together, every half-hour till sedation. With salines prevent gastric embarrassment, due to biliousness. Gastralgias and enteralgias are calmed by strychnine and hyoscyamine, a granule each, together, every half-hour till sedation. For respiratory troubles, dyspnea, angina pectoris, etc., as they may end in pulmonary œdema, oppose them without delay with iron and strychnine arsenates, and hyoscyamine, of each a granule, together, every half-hour till sedation. Individuals addicted to alcohol are liable to epistaxis; combat the hemorrhages with quinine hydroferrocyanate, iron arsenate, of each a granule together, every quarter-hour till the bleeding stops."

In urinary affections, digitalin, hyoscyamine, cicutine, arbutin,

cubebin and strychnine, can be called to aid benzoic acid in appropriate cases (Van Renterghem).

The great value of this acid and its salts is in affections of the urinary tract, as an antiseptic, soothing irritation, and under its administration bacteria disappear. It exerts a solvent action on calculi, of urates or phosphates. King says the indication for it is ammoniacal urine, or alkaline, and that it only relieves rheumatism when the urine is alkaline. In nocturnal enuresis, dysuria, the dribbling of the elderly bladder, in gleet, and in phosphaturia, it gives good results if the urine is alkaline. Wood affirms that under the use of this acid the uric acid crystals rapidly disappear from the urine. Bird praises it in uricemia.

Locally, solutions of benzoic acid may replace the tincture of benzoin for freckles, pityriasis versicolor, moth patches, chronic urticaria, all sorts of itchings, for chaps, fissures, old sinuses, and as a styptic. As an application for unhealthy wounds and ulcers, the tinctures have had a reputation for ages; but the wisest way to use them is as preventive of unhealthy states, by applying them to fresh wounds, when the benzoin forms a protective antiseptic varnish over the exposed surfaces.

Shoemaker gives the following application for freckles and moth: Corrosive sublimate gr. ss, tr. benzoin 2½ drams, glycerin 2 drams, rose-water to make 6 ounces.

Ammonium benzoate in small doses stimulates the circulation, accelerates the blood-current, and thus elevates the temperature and increases the secretions, especially those of the bronchi and the sweat glands. In large doses long continued it causes an aplastic state of the blood, with multiple hemorrhages, lesions of nutrition, and profound debility. These neutralizing and antiseptic properties render it suitable in typhoid fever, while as a diuretic it relieves certain dropsies. It dissolves the concretions of uric acid, gravel and gouty tophi. As a stimulant and sudorific it is useful in atonic arthritics. It stimulates the bronchial mucosa in dry catarrhs. The dose is one to four centigrams (gr. 1-6 to 2-3) four or five times a day.

Lithium benzoate.—Garrod exposed fragments of bone covered with urate of soda deposits to solutions of lithia, potash and soda; the first completely dissolved the deposits, the potash largely, the soda not at all. In gout lithium benzoate acts as an excellent diuretic; in uric gravel as a dialytic agent. The dose is the same as that of the ammonia salt.

Calcium benzoate has been specially recommended as a remedy for albuminuria.

Sodium benzoate occurs in white anhydrous amorphous powder, soluble in 1½ parts of water, 45 alcohol, 1.3 boiling water, 20 boiling alcohol. The antifermentive and putrefactive power of this salt is equal to that of the pure acid, or even greater (Bucholtz); as 5 to 6 parts to 10,000 prevent bacterial development.

Large doses cause trembling, convulsions and ataxic movements of the anterior extremities, progressing to complete paralysis; also vomiting, gastric hemorrhage, but no diarrhea. The pulse and respiration are first made rapid, then slowed. The temperature falls very low. Death occurs from respiratory paralysis. Sudden toxic phenomena appear in all animals experimented upon, if the dose exceeds 2-10 per cent of their weight (Schulte). In man five grams causes nausea and vomiting, preventable by strong exercise (Meissner). In addition a dose of fifteen grams caused dizziness, rapid pulse, subjective heat, sweating and expectoration (Schreiber). In fever it is an excellent antipyretic.

Like benzoic acid, the sodium salt is used as a stimulant expectorant in catarrhs of feeble or aged persons, with little or no fever, the bronchi filled with secretions; also in pneumonias occurring in such patients. Nothnagel is skeptical as to its efficiency here, as well as in uremia, uricacidemia, erysipelas, diphtheria, typhus, polyarthritis rheumatica, cholera infantum, etc.

Sodium benzoate stimulates the action of the liver and increases the elimination of nitrogen by the kidneys. In some cases its use has occasioned erythema, papules, or urticaria.

Shoemaker speaks of its use in chronic diarrheas and dysenteries, indigestion from torpidity of the liver, and excessive uric acid excretion. As an antiseptic it has proved useful in acute rheumatism, septic fevers, scarlatina, variola, diphtheria, typhoid fever, whooping-cough and erysipelas. In rheumatism it disagrees with the stomach in large doses more than salicylic acid.

Klebs recommended sodium benzoate strongly in typhoid fever, as an intestinal antiseptic. Its use in tuberculosis is now simply a matter of history. The use of this salt in diabetes mellitus is not very encouraging (Nothnagel).

Dosage.—Acid benzoic, 0.05 to 0.5 (gr. 1 to 7½) at each dose.

Sodium benzoate, 0.5 to 4.0 (gr. 7½ to 60).

These are the old-fashioned doses, designed to flush the system several times a day with a flood of the remedy. Under the dosi-

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metric system it has been found better to keep up a continuous impregnation of the blood with the remedy, by giving small doses, about gr. 1-6 of either the acid or any one of its salts, every half-hour, or one or two hours, according to the acuteness of the symptoms it is designed to relieve. The efficiency of these small doses thus given, is readily demonstrated. In chronic maladies of the urinary apparatus the administration should be continued for months, the hygienic precautions necessary being taken at the same time. When pus is passing in the urine at the same time, the addition of arbutin is advisable, and in gonorrheal infections, the sulphides of lime and of arsenic may be added. In most forms of cystitis it is also wise to wash out the bladder with a saturated solution of boric acid, and inject a dram of Euarol three times a week. But the use of these accessory measures must not divert the attention from the persistent administration of the benzoates, from which so much may be expected.

BERBERINE.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Berberine is the most universally diffused alkaloid in the plant world. It is found in a multitude of plants such as columbo, the Berberidiæ, Menispermaceæ, Ononaceæ, Ranunculaceæ, Papaveraceæ, Rutaceæ, and Cæsalpineæ. Many of these plants have acquired repute as tonics, antiperiodics and astringents, etc., the larger part of the credit being justly due to the berberine contained.

The formula of berberine is C_{20} H_{17} NO_4. It is closely related to papaverine, narcotine and hydrastine. It forms yellow needles, insoluble in cold, soluble in hot water and in alcohol, insoluble in ether. Solutions are yellow, and very bitter. The salts are golden yellow. The acetate and phosphate are most soluble. They are more soluble in pure than in acidulated water.

Physiologic Action.—Berberine appears in the bowels, even if given subcutaneously, but not in the urine. It acts on the central nervous system (Falck), first paralyzing the automatic centers, then the spinal cord. In rabbits hypodermic injections of 0.1 of berberine sulphate cause death with paralysis of the hind legs, convulsions, falling of temperature, diarrhea, and weakening heart and respiration. Death is due to asphyxia, from paralysis of the respiratory center. If not promptly fatal, albuminuria occurs, the renal epithelium becomes swollen and turbid, even fatty. But 0.8 given by the stomach is not fatal, but simply causes diarrhea, some-

times vomiting, tremor, rapid pulse and breathing and weakness. Repeated administration produces anorexia and loss of weight. Increased peristalsis is noted even when berberine is given subcutaneously or injected into the bowel. In fatal cases the latter is strongly contracted. The spleen is contracted by berberine (Falck), and also the uterus (Fellner). Small doses lessen the irritability of the vagus and slightly hasten the pulse, followed speedily by slowing, as the excito-motor ganglia's irritability is exhausted (Marfori). Fatality is due to heart-exhaustion. Small doses do not influence the blood-pressure but large ones lower it decidedly.

Berberine stops the movements of the leucocytes, while the red corpuscles become granulated and their contents diminished, the union of the oxygen with the hemoglobin becoming firmer.

Recovery from effects of overdoses of berberine is slow. The rapidity of the pulse appears to be due to paralysis of the cardiac inhibitory nerve-ends, and to the attendant fall of vascular tension; this effect being exerted on the vasomotor centers as well as on the heart. Very strong solutions exert an effect upon bacteria and upon the leucocytes analogous to that of quinine.

Berberine is in part excreted by the kidneys unchanged, the rest being broken up in the body (Cushny).

Brunton says that doses of 1.0 (gr. 15) in man, taken by the stomach, cause only slight colicky pains and diarrhea. It lessens the oxidation of the blood.

Berg took 3.6 (gr. 55) of berberine without any inconvenience, so that in man this agent is not lethal in any dose likely to be taken.

Therapeutics.—Many plants containing berberine are popular; columbo as a simple bitter, hydrastis as an astringent bitter, fraxinus as a contractor of tumors, xanthoxylon as a stimulant to unhealthy ulcers, etc. When there is a lack of tonicity in the intestines, with constipation or passive laxation, berberine is indicated. It has recently been highly recommended in enlargement of the spleen. Curci praises it in chronic dysentery and gastrointestinal catarrhs, while Beil advises it in infants' diarrheas.

Fellner used it in menorrhagia, Maggiorani and others in chronic malaria, Vehsemeyer in leukemia. In menorrhagia berberine acts only by contracting the uterine tissue, especially in subinvolution and is less effective than hydrastine, which is still inferior to hydrastinine.

Shoemaker recommends berberine as an injection in gonorrhea; as a remedy for dyspepsia, malaria and atonic diarrhea. He at-

tributes to it tonic, antipyretic, antiperiodic and cholagog properties.

Macchiavelli and Reil testify also to its value in malaria, giving 0.12 to 1.0 (gr. 2—15) during the remission. Lascarato states that the contraction of the spleen caused by berberine is so powerful that over-doses cause rupture of that organ, with fatal hemorrhage. If the spleen is degenerated there is no action. This shows the radical difference between berberine, a contractor of connective and muscular tissue, and ergotin and digitalin, contractors of blood-vessels. Berberine is useless in hemorrhages. The difference between the latter and quinine is also shown by the access of fever following the contraction of the spleen; for the parasites are thereby simply extruded into the blood, not killed. Therefore, the treatment of malaria should include berberine to force the parasites out of the spleen into the circulation, and quinine and arsenic to destroy them.

The maximum dose of berberine in malaria is 1.0 in 24 hours; but usually it suffices to give 0.01 (gr. 1-6) every waking hour. In other maladies 0.001 every hour is sufficient; for berberine is emphatically a remedy for prolonged administration in chronic maladies, in minimal doses. Thus given, its effects are notably persistent, sure and uniform.

Looking upon berberine as a stimulator of peristalsis and a contractor of relaxed atonic tissues, it has been extensively advised during the past year in cases where the relaxation, atony or defective contractility of the tissues seemed to be a bar to the restoration of health. The results have justified the high expectations based on this agent. It deserves to rank among the most certain and generally useful of "condition-remedies," if I may be allowed to coin an expression, at our command. It is very slow in manifesting its effects, but once secured, they are permanent. In employing berberine to reduce dilatation of the stomach the diet should be carefully regulated and the stomach never allowed to be distended by overfilling or chilled by iced drinks. It seems that an agent so frequently met and in such generous proportions, ought to be furnished by the chemists at a better price; and if its use continues to increase, it will undoubtedly become cheaper. But the best effects are obtained from small doses long continued, so that the unavoidable expense is well distributed.

The property of contracting connective tissue points to several other uses to which berberine could be put. Dilatation of the stomach has in many hands responded admirably to its influence,

with special care taken never to allow the stomach to be distended by food, or to be chilled by cold drinks. However, these precautions avail much in gastric dilatation, even without berberine; so that it is uncertain how much benefit really is attributable to the latter.

But in dilatation of the heart, without fatty degeneration, the use of berberine in conjunction with strict limitation of the use of fluids, is a far more rational procedure than the routine administration of digitalis. And in the enlargement of the liver that attends the advanced stages of valvular cardiac maladies, we have a field peculiarly fitted for berberine. If this drug contracts the liver as energetically as it does the spleen, its use would be exceedingly valuable here.

Granting berberine the place it seems to fill, that of inducing contraction of connective tissue, many practical applications of this principle can be made. For instance, in goiter—but I have said enough.

BOLDINE.

Standard granule—Gr. 1-67, gm. .001.

From Peumus boldo are derived an alkaloid, boldine, and a glucoside, boldo-glucin. Boldine increases the elimination of urea and the secretion of bile. Taken by the stomach it causes a bitter taste (being evidently partly eliminated by the saliva) and a sense of heat in the stomach. It increases the appetite and the digestion as well, displaying specific action upon the liver. Chronic hepatitis, jaundice, hypertrophy of the liver, hepatic colic and hepatic maladies contracted in the tropics, have been successfully treated by boldine. Bilious vomiting, headache and jaundice disappear under its use.

Houdé recommends boldine highly as a remedy for gall-stones. Naunyn says that these are formed not only in the gall-bladder but in the biliary ducts. Cholesterin and calcium bilirubinate, the principal chemical components of biliary calculi, come from the mucous lining of the biliary passages. The lithogenic mucous catarrhs may be provoked by microbes (bacillus coli, Eberth's bacillus, etc.), and are therefore of infectious origin. Such catarrhs are not acute, but the product of microbes whose virulence is much attenuated. They cause stagnation of the bile in the ducts, though not a total obstruction, the bile being evacuated normally. Normal bile is scarcely sterile, the colon bacillus being sparsely found in this fluid. The cause of concretions is found in the retarded flow.

Some calculi form rapidly, others more slowly. They may remain a long time in the gall-bladder without giving rise to any

symptoms whatever. They do harm by exciting catarrh, cholecystitis and cholangeitis. If of infectious origin the bacilli multiply rapidly. The calculi interfere with complete evacuation of the bile, with results similar to those due to the retention of residual urine in the urinary bladder; as the residual bile forms an excellent medium for the cultivation of infectious bacteria. Thus, a nidus may be formed for grave autointoxications, or infections of the bowels, the colon bacillus becoming very virulent in residual bile.

The resultant cholecystitis may provoke the expulsion of the calculi, producing the agonies of hepatic colic with subsequent jaundice or the attack of colic may itself cause the cystic inflammation.

Recovery may ensue in every stage of cholelithiasis if all the concretions are evacuated, by the gall-passages or through fistulous tracks. By a "cure" is meant the cure of the infectious element, when the malady becomes latent, the ducts being pervious. This may be permanent or only temporary. The most approved method of cure is the production of an abundance of bile. It does not follow that an agent that will produce this in health will do so when the biliary passages are obstructed. Cholagogs lose their efficacy in the presence of infectious cholangeitis.

So much for Naunyn, whose skepticism as to efficacious treatment is simply the expression of modern European therapeutic nihilism.

Therapeutics.—Houdé places boldine in the front rank of remedies for cholelithiasis, for its cholagog action is rarely wanting.

Dujardin Beaumetz and Bourgoin found it notably increased urea elimination, and especially the bile excretion, without affecting the circulation, the temperature or the quantity of the urine. This gives to boldine the character of a true hepatic stimulant. The first notable effect is an increase of the bile, then follows a diminution of hepatic congestion. When appendicitis depends on defective bile-supply it is favorably influenced by boldine, which sweeps out all organic residues whose stagnation sets up this affection. Boldine should also prove effective in the hepatic maladies consequent on prolonged residence in tropical countries. In malarial hepatitis boldine has not proved efficient, unless quinine is administered at the same time. Sodium arsenate renders the combination still more effective.

Merck's Index for 1896 gives the dose of boldine as gr. 1-10 to 1-30, and the price as $3.00 for fifteen grains.

In Parke, Davis & Co.'s Pharmacology of the Newer Materia Medica, boldo is pronounced by Zaremba most useful in gonorrhea. in atonic dyspepsia with or without biliousness, in chronic cystitis, in chronic hepatic abscess, and as a powerful anthelmintic. Eliminated through the urine, boldine increases the excretion of urea but not of water. The glucoside, boldo-glucin, has marked hypnotic properties, and is also said to compare favorably with cocaine as a local anesthetic.

Houdé advises boldine in granules of 0.001, gr. 1-67, each, of which six to twelve should be given daily. I have prescribed five to ten of these granules together at bedtime, with very good results. In one case where the renal elimination had fallen to 20 oz. daily, containing 350 grains of solid matter, five granules at bedtime raised the elimination to about 600 grains and the quantity to 64 oz. In another case, the elimination of solids rose from 300 grains to 600 and 800, with corresponding improvement in the symptoms and feelings. Two cases are of course too few for positive conclusions, but the results in these warrant me in advising a trial of boldine in these cases of defective elimination which have proved so intractable to treatment.

Houdé says that "boldine does not influence the circulation, temperature, or the quantity of urine, but augments sensibly the elimination of urea and the secretion of bile.

"Laborde found boldo exercising primitively a hypnotic action on the nervous system, with temporary suspension of the functional acts of conscious life and of relation. This was accompanied by a certain degree of anesthesia, general and of special senses, notably of hearing, and abolition of the oculo-palpebral reflex. After morphine, codeine, narceine and hyoscyamine, boldine ranks with the secondary hypnotics; but its action on the liver makes it precious in cases where the other hypnotics are objectionable. Here boldine relieves pain and favors evacuation, as in biliary calculi and other forms of calculi and obstruction.

"This observation of Laborde harmonizes with our own. Of all the hypnotics we have tried, but one resembles boldine—narceine. The sleep induced by the latter leaves a certain degree of consciousness, which boldine does not, but the awakening is as free from disagreeable sensation in the one case as in the other. Narceine, like all opium derivatives, cannot be administered during digestion, at least during the first part, which is not the case with boldine.

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"Boldine causes considerable increase of the biliary secretion, and dissipates hepatic congestion and functional ailments of this organ. In simple jaundice, hepatic colic, chronic hepatitis, appendicitis, and hepatic ailments of hot or unhealthy countries, the good effects of boldine are no less manifest. It is in fact a specific for hepatic maladies in general, even for cirrhosis.

"Boldine does away with the failures encountered in using boldo; due to manifest insufficiency of the dose. Of the granules containing each 0.001 (gr. 1-67), the daily dose is 6 to 10, which are always efficacious in acute hepatic colic, biliary calculi and acholic jaundice. One kilogram of boldo contains .02 to 0.03 of pure boldine, so that the effect of the ordinary medicinal doses of the latter are insignificant.

"Boldine favorably influences appendicitis, which ends without suppuration. The abundant production of bile induces a general evacuation of all the organic residues in the bowel, whose stagnation is the point of departure of inflammation of that part of the intestinal canal.

"Boldine ameliorates alike the hepatic affections due to any form of alcohol, to a diathesis, or to a residence in hot or unhealthy countries. Hypertrophies of paludal origin feel its good effects as well, but the improvement is more rapid if quinine is also given. With profound debility, sodium arsenate should be added. Begin with one granule, 0.001 five times daily, gradually increasing until the daily dose reaches ten granules, if necessary and well supported. But if the hypnotic effect is desired give a granule every fifteen minutes at bedtime. Six granules secure 6 to 8 hours normal sleep."

BRUCINE.

Standard granule—Gr. 1-134, gm. .0005.

Brucine is the companion alkaloid of strychnine in nux vomica and ignatia. Brucine exists in nux vomica seeds in the proportion of ½ to 1 per cent, strychnine being present in from ¼ to 3-5 per cent.

Brucine is soluble in 320 parts of cold and in 150 parts of boiling water; in alcohol, very freely in chloroform or in benzole, very slightly in benzine, not at all in ether. The salts are freely soluble. Brucine is even more bitter than strychnine.

Physiologic Action.—There is much diversity in the reports on the action of brucine, partly due to the difficulty experienced in getting it

free from strychnine. Reichert said it was precisely similar in effects to strychnine, except that the latter is more quickly absorbed. and exerts forty times greater convulsant force; brucine having greater toxicity as to the sensory nerves. Cushny also states that brucine exerts much more action on the nerve-ends in voluntary muscle than strychnine. But Wintzenried says brucine stimulates the spinal cord, paralyzes the motor nerves and has no effect on the cerebrum or the sensory nerves; at first raising and then depressing arterial pressure; while large doses paralyze the vagi, death occurring from asphyxia. When taken by the mouth no symptoms ensue, because the drug is excreted as fast as it is absorbed.

Reichert says it causes a brief motor paralysis before the convulsions; but Shoemaker affirms that it may cause death without any convulsions.

Brunton found that brucine checks oxidation of the blood and the excretion of carbonic acid; greatly increases reflex excitability; causes tetanic convulsions; acts as a stimulant to the respiratory center, making the respirations deeper and quicker, and the lungs do more work.

Although brucine requires a longer time for absorption than does strychnine, death comes sooner when lethal doses are given, because the former is quicker in getting to work. We cannot therefore subscribe to the view of Murrell, that brucine is only a mild strychnine and completely represented by the latter in small doses. We have repeatedly noted the quickness with which the effects of brucine are manifested, and in many cases this is of the utmost value, as time may not be allowed for the slower remedy.

When the salts are employed, and administered in solution, in hot water or hypodermically, the effects of brucine are most valuable in syncope, from sudden loss of blood, exhaustion from heat and excessive water-drinking, or from the effects of depressing drugs or exhausting discharges.

Therapeutics.—In many emergencies the speedy action of brucine renders it preferable to strychnine. By its quick action and speedy elimination, brucine is admirably adapted to the intensive dosage, the use of small and oft-repeated doses. While it is said to have only one-fortieth the strength of strychnine, we rarely find it advisable to give more than gr. 1-67 to 1-134, repeated every five to thirty minutes till the requisite degree of tonicity is attained. When it is desired to keep up this effect, strychnine may be given with or after brucine. In emergencies when quick action is emi-

nently or urgently indicated, from gr. 1-12 to 1-2 may be given at once; but personally the writer has never found it necessary to exceed gr. 1-8. In one case of alarming heart-failure from over- exertion, in a man aged over seventy, this dose was given, with atropine gr. 1-134, with the best effect, and permanent recovery ensued. This case had been diagnosed as a "hopeless" case of heart-clot by a distinguished practician and teacher, and left with that prognosis.

Merck advises his brucine in doses of gr. 1-12 to 1-2; maximum single dose gr. 3-4, daily 3 grains.

Mays reported that brucine exerts a marked local anesthetic effect, in solutions of 5 to 10 per cent. This has been confirmed by Seiss, who pronounces it less reliable than cocaine, and found large doses cause nervous irritability lasting several hours. The writer has employed a mixture of brucine and cocaine, 2 to 5 per cent of each, in some cases in which the latter alone gave rise to symptoms of collapse, with excellent effect.

Burnett tried brucine locally in pruritus, etc., and preferred it to cocaine. In chronic forms of pruritus it is effective, and preferable to cocaine as not being liable to result in an injurious habit. In fact, this local anesthetic effect of brucine may indicate its value as a substitute for morphine and cocaine when used hypodermically.

In making solutions of brucine salts Wood advises the addition of one drop of sulphuric or hydrochloric acid for each three grains of the drug. The antidotes are chloral, chloroform and tannic acid.

The seeds of nux vomica contain about 2.88 per cent of alkaloid, equally divided between strychnine and brucine; Strychnos tieuté contains 1.429 per cent of strychnine and traces only of brucine; Strychnos ignatia has 1.39 per cent strychnine and traces of brucine; the bark of false angostura and that of Strychnos colubrina contain about 2.4 per cent of brucine and traces of strychnine; Strychnos ligustrina has brucine alone; and Strychnos gautheriana—Hoangnan —contains traces of strychnine and 2.7 per cent of brucine. These are but averages, the true composition of each differing in various samples; so that the use of the galenic preparations of these potent plants gives a variety and uncertainty the reverse of pleasing. Falck examined some specimens and found the tincture containing from 0.244 to 0.353 per cent, the alcoholic extract from 7.3 to 8.59 per cent, equally divided between strychnine and brucine; while the aqueous extract contained 3.18 to 4.3 per cent, one-fifth strychnine and four-fifths brucine.

Brucine is for children and persons in feeble health what strychnine is for adults and persons strongly constituted. For the child brucine is the incitant *par excellence*. Brucine may be given to infants a granule at a time, every quarter hour in acute cases, till effect; four to six granules a day in chronic affections, with other remedies as indicated. For adults very susceptible to strychnine two to four granules may be given at each dose (Van Renterghem).

BRYONIN.

Standard granule—Gr. 1-67, gm. .001.

From Bryonia dioica is derived the glucoside bryonin. It is colorless, very bitter, soluble in water and in alcohol, insoluble in ether or in chloroform.

Large doses of bryonin cause grave inflammation of the stomach and bowels, vomiting, uncontrollable diarrhea, vertigo, fall of heat, dilation of the pupils, cold sweating, colic, collapse, extremely small pulse, and death (Felter-Lloyd). Bryonin is less irritant than the galenic preparations and in moderate doses is simply laxative.

Therapeutics.—Bryonin has been recommended for convulsions due to intestinal worms, for dropsy, chronic inflammations with enlarged glands or serous effusions; in scarlet fever to prevent ear complications; chronic orchitis, rheumatism, pleurisy, pulmonic disorders, fevers, to relieve constipation (Felter-Lloyd).

The authors just quoted enumerate its uses as follows: Lung diseases, for sharp, cutting, lancinating pain with harsh cough; pain intense and tearing, worse on motion, parts feel stiff, sore and bruised, much mucus in bronchioles; pulse hard, frequent and vibratile, high fever; right cheek flushed; for serous inflammations, peritonitis, or synovitis; frees circulation, overcomes capillary obstruction, lowers fever and controls pain; lessens nervous excitation and erethism, and promotes secretion and excretion; rheumatic conditions of the chest and pleurodynia; best in pleurisy, especially if insidious and complicated, when bryonia stimulates absorption; bilious pleurisy, pleuropneumonia, bronchitis with blood-streaked sputa, pneumonia with pleuritic pain or short, sharp cough, worse on motion; in typhoid pneumonia, with baptisia; in phthisis to control pain, fever and cough; for cough and pain in influenza excels all other remedies but gelsemium; laryngeal and tracheal cough; dry, rasping, hacking and explosive, with tensive, sharp pains; little secretion; irritative cough aggravated by talking, eating, or en-

tering a warm room; the condition is a debility and patients sweat easily; often controls fever when ordinary remedies fail; chilliness, tension and easy sweating indicate bryonin; with peculiar pains, deepened color of mucosa and full veins, frontal headache, dry tongue, and tendency to delirium.

It is excellent in hepatic disorders with jaundice, high-colored urine and pain on pressure, stitching, sticking or cutting pains about liver; acute or chronic rheumatism; painful and stiff spine in children, rheumatic headache, sharp temporal or frontal pain, tender scalp, worse on motion; rheumatism of fingers (Locke); ovarian and menstrual wrongs with tenderness; acute mammitis; partial deafness from cold or scarlet fever; scrofulous eyes, ears, ulcers and synovitis, with stinging, burning pains; tensive earache in children; facial neuralgia with weak heart, cold hands and feet; rheumatic iritis with pain on moving eyeball; heart-strain and organic heart troubles when exposure and rheumatic twinges bring on the paroxysms; peritonitis with colicky pain, unusual tenderness and tension; pericarditis tending to hydropericardium; brain disorders with serous exudation; indigestion, food lying heavy like a stone; typhoid fever with pulmonary complications; abdominal tenderness and pain in typhomalaria, zymotic diseases and in cholera infantum with ipecac or euphorbia (Scudder).

Scudder gives the specific indications for bryonia as: A hard vibratile pulse, flushed right cheek, frontal pain extending to basilar region, and irritative cough.

Felter and Lloyd insist on the pain worse on motion as a cardinal characteristic.

We have given the eclectic accounts of this drug in full because it is one they value very highly. In the writings of the regular school but little is to be found on this once popular remedy. Van Renterghem tried bryonin on his own person, taking gr. 1-12 every hour till gr. 1-2 had been taken. No abdominal pain ensued, nor action on the bowels, the night was passed in comfort and at 6 a. m. he was awakened by the calls of the bowels, passing semi-solid stools. The action follows in 8 to 12 hours. Doses of gr. ½ to 1½ purge violently with atrocious pains and choleraic symptoms. As synergists he enumerates jalapin, colocynthin and elaterin; with podophyllin in large doses. Atropine is an excellent auxiliary and corrigent, by its antispasmodic power and as regulator of peristalsis. Morphine, cotoin and tannic acid antagonize bryonin. He suggests its use as a succedaneum for podophyllin. Acting specially on the

cecum, bryonin relieves this and the colon from torpor. The field for it is in abdominal torpor, bilious fevers and dysenteries, verminous and stercoral colics. To him it is evidently a cathartic and no more.

Shaller found that bryonin stimulated the kidneys, increasing the quantity of urine. He recommends it in all forms of dropsy, to promote absorption of the effused liquid. For torpid liver and biliousness he finds it of value. In serous inflammations, after fever has been reduced by aconitine, there frequently remain various painful and annoying conditions that may last years; such as the headaches after meningitis, the stitch in the side after pleurisy, the precordial pain of chronic pericarditis and the joint ails after rheumatism—all which are cured by bryonin. The principal field for bryonin is in the alleviation and cure of chronic inflammations of serous membranes. He advises doses of gr. 2-67 every two hours till decided physiologic action is denoted by thorough evacuation of the bowels; then half this dose. If pain ensues he adds atropine. Several weeks are required to cure chronic affections.

Dr. W. B. Robertson found a few granules relieve the stiffness following long bicycle rides by a novice.

Dr. C. Stanton gave gr. 1-67 every fifteen minutes for neuralgic headache and got relief from the second dose. To a lady who had stopped menstruating for two months from cold he gave gelsemin gr. 1-134 and bryonin gr. 1-67 every half-hour till the menstrual discharge appeared, which was less than 20 hours.

Dr. W. H. Blythe reports the case of a man who had been injured in the chest by the handles of a truck. He could not turn over for pain. He was given bryonin gr. 1-67 every two hours, and after taking 17 doses was able to leave his bed.

BUTYL CHLORAL HYDRATE.

Standard granule—Gr. 1-6, gm. .01.

Butyl chloral hydrate, formerly known as croton chloral, is a remedy with but one clear cut and distinct indication. It was introduced by Liebreich as a remedy for painful affections of the trigeminal nerve. This property is denied by von Mering, who, with Cushny and Wood, consider it does not materially differ in action from the ordinary chloral hydrate. But Hare states that it is more analgesic and less depressant to the heart and circulation, and better for insomnia due to pain. It is quite effective in facial neuralgias

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and migraine, especially if the fifth nerve is affected; also for headaches due to eyestrain, sick headaches not dependent on disorder of the stomach or on nervous debility; and while useless in toothache is beneficial in neuralgias dependent on decaying teeth—a very nice point in diagnosis!

Liebreich found toxic doses cause deep sleep, trigeminal anesthesia and stop the respiration, the circulation continuing. Von Mering found it lessen the blood-pressure.

Butyl chloral relieves the pangs of tic douloureux with striking quickness. The dose required to relieve pain is smaller than that necessary to produce sleep. The sleep is short as compared with that due to chloral hydrate. Complete trigeminal anesthesia requires doses of thirty to sixty grains; by which the corneal reflex is abolished, and yet the spinal cord is unaffected, as the reflexes of the trunk and extremities and the muscular tonicity are normal, as well as the pulse and respiration.

Bronchial irritability is relieved by butyl chloral, and Shoemaker speaks of it as assuaging the pains of dysmenorrhea.

Dentists administer this agent to allay the suffering from inflammation of the pulp or the peridental membrane, or of a recent filling that is making itself disliked. Mixed with equal parts of menthol and carbolic acid, it is applied on cotton to carious cavities, the mouth in all cases being washed first with sodium carbonate solution.

Butyl chloral is but slightly soluble, in water 100 parts, in 4 of glycerin, in alcohol, ether or hot water.

For over-doses the antidote is strychnine in doses sufficient to excite the spinal cord. Per contra, butyl chloral is an efficient antidote in strychnine poisoning.

The dose as an analgesic is usually given as gr. iij to v, every two hours; as a hypnotic gr. xv to xx; but excellent results are obtained from a grain every quarter-hour. The powder is irritant to the stomach. Brunton recommended administration in syrup of tolu or in almond mixture. Another mixture is butyl chloral 5 to 10 parts, glycerin and alcohol each 20 parts, distilled water 100 parts.

This is a safe and effective anodyne and hypnotic for little children, who can take a granule containing gr. 1-6 repeated at very short intervals. It is somewhat difficult to distinguish the varieties of headache that are amenable to butyl chloral, but in general those due to eye-strain and when the pain seems to be confined to the scalp, are relieved by this agent with remarkable quickness.

Von Mering's conclusions were derived from experiments upon animals in a state of health; and, as Binz remarks, these negative results prove absolutely nothing against the positive ones obtained by clinical trials with human beings when ill.

Yeo administered butyl chloral with success in nervous and spasmodic coughs, and Nicholson found it effective against whooping-cough.

Butyl chloral has been used with advantage to anesthetize the eye or the face before operations on these regions.

Van Renterghem gives ten granules repeated every ten minutes for tic douloureux; for insomnia triple this dose, continued till effect. In tooth-ache he has succeeded by introducing a granule in the cavity of the aching tooth, repeating two or three times.

CACTIN.

Standard granule—Gr. 1-67.

Cactin is a glucoside, the active principle of Cactus grandiflorus, the night-blooming Cereus of the garden. It shares a position with digitalin, strophanthin, convallamarin and adonidin as a reliable heart stimulant. Its efficacy is most apparent in cases where medication has to be continued for a prolonged period; it also acts often after all other remedies have failed. The dose is two of the standard granules (gr. 1-67) every three to four hours. In mild cases of heart weakness where slight stimulative and "supportive" action is required one granule may be given three times daily for months and with marked advantage.

Cactin "increases the musculo-motor energy of the heart, elevates arterial tension and increases the height and force of the pulse wave" (Ellingwood). This describes its action perfectly. The vaso-motor centers are stimulated and thus general nerve tone is improved. Cactin has a distinct influence over the sympathetic; it aids markedly in restoring nerve equilibrium in all neuroses, and as we frequently meet heart and nerve disorders conjointly, the utility of the remedy becomes apparent. It acts positively upon the heart muscle and also increases its nutrition. After a week or two of its use valvular murmurs become less apparent and, if the drug is continued, cease.

Therapeutics.—Cactin is indicated in all weakened conditions of the heart muscle, in valvular inefficiency and in all cases with irregular and intermittent pulse. Its action upon the heart muscle is

permanent and for general trustworthiness and utility it is hard to name a remedy of the class which equals it. In neurasthenia with strychnine or zinc phosphide, cactin will give excellent results; in nervous excitement and hysteria with headache at top of head it is always useful. It has been recommended in impotence in conjunction with cornin and strychnine and phosphorus and marked improvement has followed its use in such cases. In endocarditis and pericarditis it has been used with success and in the feeble heart action of pneumonia and other acute diseases it acts with certainty and promptness. One granule with gr. 1-67 of strychnine will, if given every four hours, sustain the heart through the most trying periods.

CAFFEINE.

Standard granules—Caffeine alk., gr. 1-67, gm. .001; caffeine alk., gr. 1-6, gm. .01; caffeine arsenate, gr. 1-67, gm. .001; caffeine benzoate, gr. 1-67, gm. .001; caffeine benzoate, gr. 1-6, gm. .01; caffeine citrate, gr. 1-6, gm. .01; caffeine valerianate, gr. 1-67, gm. .001.

Caffeine has been found in the coffee of Arabia (Caffea Arabica), the tea of China (Thea Chineasis), the chocolate of Mexico (Theobroma Cacao), the guarana of Brazil (Paullinia Sorbilis), the mate of Paraguay (Ilex Paraguayeasis), the kola of Africa (Cola Acumimata), and the yopon or Appalachee tea of the Carolinas (Ilex Cassine). All these plants and no others contain caffeine; all these, out of the myriads of plants produced by the earth, have been selected by the natives of these countries for use in hot beverages.

Is this simply chance? Or is it to be taken as showing that in caffeine there is some remarkable fitness to meet some unknown need of the human economy, some want unrecognized but nevertheless real, felt alike by these various races and by all mankind, savage, barbarous and civilized, in torrid, temperate and frigid zones, by the sea, on the sea and in the mountains?

The caffeine used in medicine is obtained from tea leaves by sublimation, or by inspissation of the extract with alcohol, the tannic compound being first broken up by lead acetate. Chemically caffeine is trimethylxanthine. It has been formed synthetically. It is a weak base chemically, crystallizing in white, lustrous, flexible needles, soluble in 80 parts of cold and 2 of hot water, 50 parts of alcohol, 9 of chloroform, sparingly in ether. It is somewhat bitter. With strong mineral acids it forms easily decomposable salts. It

does not form salts with organic acids and may be volatilized as caffeine from their mixtures. But with organic acid and soda salts, such as sodium benzoate or salicylate, caffeine forms double salts which are very soluble in water.

On frogs caffeine causes contraction with stiffness of the muscles, especially evident when a muscle is dissected out and immersed in caffeine solution, or when the latter is injected into the substance of the muscle. This is due to direct action on the muscle by increasing the fibrin ferment. All xanthine derivatives possess this power, which is weaker when the methyl group is associated, as in theobromine and caffeine. The frog's heart resists the caffeine effect, continuing its rhythm after the striated muscles have stiffened tetanically.

Administered to warm-blooded animals in non-toxic doses, reflex irritability is increased, the animal starts at every touch, and becomes tetanic at times even without evident cause. Small doses increase the pulse-rate; larger doses render it irregular and slower till the heart stops in diastole. This is due to a direct stimulation of the cardiac accelerator apparatus and not to paralysis of inhibition, for under atropine the same effect is manifested.

Small doses increase vascular tension, larger ones depress it. The former effect is due to direct excitation of the heart and of the vasomotor center, contracting the peripheral arteries.

Respiration is quickened at first, inspirations becoming deeper; later it becomes slower. This action resembles that of strychnine.

The temperature rises about one degree F. after medium doses, and between two or three degrees after toxic doses. This is doubtless due to the muscular stimulation and increased vasomotor tension.

No effect upon peripheral nerves, motor, or sensory, has been determined after caffeine was administered internally in ordinary doses; but steeping a motor nerve in caffeine solution or injecting the latter around a sensory nerve produces rapid paralysis of function.

The lethal dose of caffeine for dogs is about 1-5000 of the animal's weight. Cats require double this dose.

The action of caffeine on the kidneys is complicated. The urine is lessened in quantity by contracting the renal arteries, when large doses are given. Small doses appear rather to stimulate the heart and increase the flow of urine. If the irritability of the nerves is lessened by chloral or paraldehyde, preventing the vasomotor ten-

sion, caffeine increases the excretion of urine. Liebreich credits this to direct irritation of the renal epithelium.

Metabolism is little affected. The excretion of urea and carbonic acid is increased by the stimulation of muscular contraction. No material changes of the blood have been noted.

In man small doses up to 0.1 (gr. 1½) slow the pulse somewhat. Larger doses cause toxic symptoms, tinnitus aurium, tremor of the hands, temporal pulsation, headache, flashes, vertigo, insomnia, mental confusion or delirium, amblyopia and transient deafness, palpitation of the heart, rapid pulse, irregular heart-action, and a sense of oppression in the chest, some cases present erections, strangury, dysuria, anesthesia of the throat and tongue, with swelling and muscular stiffening up to the production of tetanoid spasms. Sometimes alarming heart-symptoms follow, even after small doses, especially in myocarditis. There are no cumulative effects, but idiosyncrasies against caffeine may exist. Larger doses are well borne by those accustomed to the drug. In any case, the alarming symptoms quickly subside, the caffeine being rapidly eliminated by the kidneys and liver or broken up in the body.

Caffeine is readily absorbed by all the mucosa and by the cellular tissues. Urea may be split off from caffeine, as the excretion of the former is increased while taking caffeine. The latter is found in large part unchanged in the urine, and as monomethylxanthine.

Experimenting on healthy men it is necessary to give doses of at least five grains to obtain appreciable results, allowing for idiosyncrasies, and possibly, for the habitual use of coffee and the consequent resistance. Kelp gave eight grains to a nervous woman, with toxic effects disappearing within 24 hours; such as vertigo, sense of general fatigue, precordial anxiety, rapid pulse, abdominal pulsation, followed by trembling of the extremities, grinding of the teeth, later by heaviness of the head, and spasmodic contractions of the muscles of the neck and nucha.

But Frerichs, after taking a dose of 30 grains, felt only heaviness of the head, congestion of the brain, and vomiting, quickly followed by disappearance of the other symptoms. It is probable that the whole of this dose had not been absorbed.

Men may accustom themselves to ascending doses of caffeine; and the gravest symptoms of over-doses soon disappear.

Caffeine stimulates the striated muscular fiber, which explains

the imperious need of emptying the bladder after drinking coffee, and why coffee removes the sense of fatigue after long marches.

Caffeine penetrates the organism rapidly, its effects are evanescent, its elimination rapid, by the bile and the urine.

Leblond, studying a hernia, found that caffeine augmented the muscular contractility of the intestine. Hannon and Peretti found it excited the intestinal secretions and even caused diarrhea. Leven and others credited it with favoring the secretions of saliva and of bile. Gubler and others found it provoked an abundant diuresis.

Small doses augment, toxic doses paralyze, respiration.

The pulse is lessened in frequency, increased in power; the blood-pressure raised by vasomotor contraction; and toxic doses cause the pressure to fall rapidly.

The observations on the body heat are contradictory, some testifying to a rise, others to a fall. Caffeine is a powerful stimulant to metabolism, and when the temperature is subnormal from deficiency of this function, caffeine will raise the heat to the normal point. This action I have frequently seen in studying persons who had discontinued the use of morphine. In a few months there is a notable fall of temperature, with oppression of the chest, and various unpleasant subjective sensations, which are relieved by quickly flushing the emunctories and giving caffeine. So also when the temperature has been depressed by exposure to cold, coffee will raise it to the normal point more quickly than the same quantity of hot water alone. But in fevers the same agent will not elevate the body heat, but even lowers it sensibly.

The effect on urea is obscure. The excretion is lessened, but this is probably due to the conservation of tissue, lessening waste. Lehmann and Froehlich claim that caffeine retards the decomposition of organic elements. Voit denied this, and declared that it does not modify the excretion of urea. Roux found that in his own case it increased the excretion of urinary solids, especially urea and chlorides, but on the establishment of the "coffee habit" the excretion returned to the normal. But Binz wisely remarks that the elevation of temperature contradicts the diminished excretion of urea. Caffeine must increase the loss of urea and of carbonic acid. Nothnagel says the metabolism (organic exchanges) is not notably influenced by caffeine; and as applied to healthy men this is probably correct.

Burggræve said: "It is certain that caffeine, like the alkaloids in general, hinders combustion. This is especially the case with

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caffeine arsenate. We know how rapidly fever emaciates, and how soon fever falls after a dose of black coffee. When quinine has been scarce, intermittents were broken by coffee. Whence this fever? An exaggerated combustion, an elevation beyond measure of the animal caloric, greater when the fever presented marks of malignity or ataxia. We ourselves tried it, being heated, the body deranged, bile lessened, when caffeine arsenate rapidly reëstablished this secretion and lessened the uric acid in the urine.

"A boy with a wounded knee had fever of 40 C., ataxia, pulse 130, odor of mice, urine scanty and loaded with urates, exaggerated combustion and visible wasting. The urine contained 3.4 per cent of urea. Thirst being normal he drank only the usual quantity of liquids, and took four daily doses of caffeine arsenate, three granules each. From the first day the effect on calorification was manifest, fever fell, the skin and tongue became moist. The bowels opened more freely, and in three days the improvement was notable. Veratrine was given for the accesses of fever due to the wound, these medicaments not excluding each other. The urea fell to 1.4 per cent.

"Urea is a sort of cinder. In fever the operations of nature are simply accelerated, the denutritive combustion augmented, more cinders produced, and the kidneys cannot eliminate them fast enough. We arouse the vasomotor nervous system from torpor by the alkaloids and retard combustion by the arsenates."

Synergists of caffeine are, theobromine, strychnine, quinine, and in some respects digitalin and the arsenates.

Morphine antagonizes caffeine, but when the latter is given as Burggræve advises, morphine may be added to prevent or relieve insomnia, without interfering with the action desired.

Liebreich recommended caffeine in fevers with weak heart, especially in œdema of the lungs, as a heart-tonic and diuretic; also in renal and cardiac dropsies. In valvular affections he preferred digitalin and strophanthin. But when the heart-muscle no longer responds to the usual stimulants caffeine may be given with advantage. This applies as well to the treatment of renal diseases.

Zenetz dissents strongly from this use of caffeine, which he stigmatizes as treacherous, deadly in large doses, from sudden stoppage of the heart in systole. He found caffeine in the urine fifteen days after its administration ceased. Remedies should not be repeated while still in the body and necessarily exerting an effect. This causes cumulation. The more the kidneys are diseased, the slower

is the excretion of caffeine. If extensive, any active remedy will accumulate. In fact the task of the day is to ascertain how powerful remedies once taken into the body are going to get out of it. And in this the vast importance of kidney-elimination must be recognized.

Therapeutics.—In myocarditis, functional heart-diseases, caffeine is the appropriate remedy; and in all cases where a quick and lasting heart-incitation is required.

Headaches in chlorotics, and hysterics' migraines, are relieved by caffeine. The effect on neuralgia is uncertain.

In 1864 Botkin and Koschlakoff prescribed caffeine in dropsies, and in 1880 Leech recommended it especially in dropsy attending organic heart-diseases. Lepine, Huchard and Leblond followed, and finally Riegel ranked caffeine with digitalis. Based on 21 cases where caffeine was given alone or with digitalis, he deduced the following conclusions:

1. Caffeine shares with digitalis a regulating power over the heart.
2. In proper doses caffeine augments the heart's energy and retards its action, increasing arterial pressure.
3. It quickly provokes a notable diuresis.
4. The indications are the same as for digitalis.
5. The best mode of administration is by small doses often repeated.
6. It excels digitalis in an action more rapid and non-cumulative.
7. It can be given with benefit where digitalin is inactive.
8. The simultaneous use of narcotics like morphine is not to be recommended.
9. In general, caffeine is as well and often better tolerated than digitalis. The double salts of soda with benzoic, salicylic and cinnamylic acids, are especially commendable from their extreme solubility and facility for hypodermic use.

But the wholesale condemnation of digitalis is wrong.

We are often compelled to combine with caffeine and digitalis, strychnine in cardiac insufficiency with dyspnea, or hyoscyamine if there is a spasmodic element. In fevers with rapid wasting some form of arsenic is to be added, the arsenate of caffeine being eligible.

Caffeine has proved a sovereign remedy in certain forms of headache, migraine, hemicrania, with throbbing arteries (Burggræve); those of chlorosis, or symptomatic of hysteria, and those

where there is a general ache not associated with hyperesthesia of the scalp (Rossbach).

How does it cure headache? We will wait, says Schmiedeberg, till we know the exact nature of the malady.

The stimulant effect of this agent on the cerebral cell is shown in cases of intellectual and nervous torpor; in coma, somnolence; in the state consecutive to long loss of sleep, from sunstroke, alcohol or the abuse of narcotics. In typhoid coma, and in the somnolence that accompanies the profound anemia of hemoglobinuria, caffeine arouses the brain.

In military service caffeine is of inestimable value in enabling the soldier to endure long marches with little food, that he could not possibly have endured without it. Strychnine is an aid here. In removing the sense of hunger and of fatigue caffeine approaches cocaine; in stimulating the nerve-cell and the muscular fiber it ranks with strychnine.

Burggræve called attention to the value of caffeine in relieving the accidents due to the abuse of tobacco, and to its cholagog power. Caffeine arsenate neutralizes the stupefying effects of tobacco, and relieves the asthma, dyspnea, dyspepsia, cerebral congestion, and intermittent neuroses, caused by tobacco. In catarrhal and rheumatismal jaundice he insisted on general baths, with mild laxatives, and recalled the secretion and discharge of bile by the use of quassin and caffeine, esteeming them the best since they cause no intestinal irritation; and as Liebig said, caffeine augments the taurin. The depression of the pulse does not permit the other alkaloids; unless in continued fever when veratrine and aconitine are needed, especially with cutaneous hyperesthesia. In spasmodic jaundice it is atropine that is needed; but if the spasm depends on weakness one can give strychnine or brucine, alone or with quassin and caffeine. In malarial jaundice we must insist on quinine, with quassin and caffeine to restore the bile. Watch the proper time and do not force the remedy.

Olliviers has reported two cases where caffeine exerted an anthelmintic action, in children.

Eulenberg used caffeine hypodermically for neuralgias.

The effect on the contractility of the intestinal muscles has led some to try it in strangulated hernia.

In continued, intermittent and adynamic fevers, several have used coffee; and others have given it with success in asthma.

The hypodermic administration of caffeine presents many ad-

vantages—in coma, narcotic poisoning, irritable conditions of the stomach, and when the local analgesic effect is desired in treating neuralgias.

Dosage.—Dujardin-Beaumetz and Huchard have given caffeine in doses up to gr. 45, thrice daily; the latter limits the useful dose to 18 grains. These doses are toxic and are not to be advised. Six grains have produced toxic effects, and 7½ grains occasioned convulsions (Sevestre).

When we get rid of the idea that the proper dose is all a patient can take without actually killing him, and learn to measure our doses by the effects to be secured, we find that caffeine itself is best given in doses of a grain, singly, and up to seven grains a day, while the arsenate is most useful in granules of gr. 1-67 each, and rarely more than seven to ten of these in 24 hours. The citrate of caffeine is too uncertain for accurate medication. The same might be said of the valerianate, but this is the most active diuretic of the caffeine salts, and in doses of a grain has proved on many occasions its great value.

In treating the subnormal temperatures of men formerly morphine addicts, the hypodermic dose of three grains once or twice a day was rarely exceeded, and this was not often required. In fact, in treating headaches of great intensity, gr. 1-6 every ten minutes rarely fails to give relief within an hour or two, if this remedy is indicated. If due to autotoxemia, it may even relieve before the bowel has been emptied of its poisonous contents, but this is not good practice.

As a cardiac tonic, from 1-6 to one grain should be given every hour till the required tonicity is secured; and in view of the rapid excretion of caffeine this is better than less frequent larger doses.

In wasting fevers Van Renterghem recommends the arsenate up to 20 granules a day, each gr. 1-67. In prolonged deprivations of sleep it is of the utmost importance to give just enough and not any more; so that the little doses frequently repeated as per the need are excellently calculated. So also for soldiers on the march; use just enough and no more, and good will result; give too much, exhausting the susceptibility of the system and disappointment must ensue.

In nicotism Burggræve recommended the arsenate, ten to twenty granules a day, the patient moderating or ceasing the use of tobacco.

Liebreich gives the dose of caffeine in hemicrania as 0.1 to 0.2 (gr. 1½ to 3), in heart-weakness as 0.05 to 0.1 (gr. 5-6 to 1½),

every hour or two; and 0.6 to 0.8 (gr. 9 to 12) as a daily dose. It may be given in wafers, pills or pastilles.

When giving caffeine to young persons showing nervous irritability, it is best to administer the daily dose in the early part of the day to avoid insomnia.

The daily maximum dose is variously stated by European pharmacopœias as 0.5 to 1.5 (gr. 7½ to 23).

For hypodermic use the double salts are preferable on account of their great solubility. Of caffeine alkaloids—

The	caffeine-soda		benzoate	contains	46	per	cent
"	"	"	cinnamylate	"	62.5	"	"
"	"	"	salicylate	"	62.5	"	"
"	"	"	hydrochlorate	"	52	"	"

The salicylate may be prepared easily by taking 35 grains sodium salicylate, 40 grains caffeine, and distilled water to make two drams, of which three minims contain one grain of caffeine. For hypodermic use this should be made with chemically pure sodium salicylate; that of Schering being the only one I have found that gave a colorless, unirritant solution. This should be injected the moment it is taken up in the syringe, or the metal of the needle will be acted upon and will contaminate the solution. The syringe should be washed at once after being used.

Caffeine-sulphuric acid forms salts that are said to have no vasomotor tensor power whatever, while they exert the diuretic properties of caffeine to the fullest extent. The sodium, lithium and strontium caffeine sulphonates are known as symphords. They are soluble in cold, more rapidly in hot water; the solutions are not permanent. They have proved efficient diuretics in dropsy, obesity and fatty heart, in doses of 4.0 to 5.0 (gr. 60 to 75) per diem.

Bromo-caffeine, $C_8 H_9 Br N_4 O_2$, is produced by treating caffeine with bromine at a slowly rising temperature.

Ethoxy-caffeine $C_8 H_9 (OC_2 H_5) N_4 O_2$. The introduction of the ethoxyl group adds to the cardio-vascular tensor effect of caffeine a narcotic property. It has been given in doses of 0.2 to 1.0 (gr. 3 to 15), in hemicrania and trigeminal neuralgia. Collapse with vomiting followed doses of 0.5 (gr. 7½). It must be given therefore with caution.

CALCIUM CARBONATE.

(CALCALITH—ABBOTT.)

Standard tablet—Gr. 10, gm. .6.

Calcium carbonate is too abundant in nature to require description. Its principal employment in medicine is as a remedy for the uric-acid diathesis, and when so used should be in the c. p. form. A few sentences of introduction are therefore necessary:

We know essentially nothing positive in regard to the real primary cause of the uric-acid diathesis, but it is clear that any attempt to remove the consequences of this uric-acid accumulation must be directed (1) towards removing the excessive uric acid from the blood and tissues, (2) towards preventing the deposits of crystalline urates, and (3) towards attempting to re-dissolve these concretions after they have once formed. This brings us to the fundamental therapeutic question that has agitated physicians for over a century, namely, "What can we do to dissolve uric acid after it has been deposited and what can we do to hold it in solution so that it will not be deposited or redeposited?"

There are a great many so-called "uric-acid solvents," the leading ones being alkalies, the salts of lithium, colchicum, lysidin and uricedin. Now, as a matter of fact all that we know about these different bodies is that they possess the power of dissolving uric acid in a test tube, that is, outside of the body, and it is exceedingly questionable whether they possess the same power when circulating in the blood and tissue fluids. It seems hardly possible that they should be able to perform this function, for, when we administer a few grains by mouth, very little of these different bodies ever reaches the uric-acid deposits. One might as well expect to reduce obesity by administering small quantities of ether on the ground that ether is capable of dissolving fat outside of the body, or expect to dissolve the lime salts in osteophytes or calcareous tubercles by the administration of mineral acids, on the ground that these will dissolve lime salts in a test-tube.

There is finally another fallacy about all this (and this applies particularly to the administration of small quantities of lithium salts), the *lithium carbonate never enters the bood as a carbonate but as a chloride,* for as soon as it reaches the stomach the hydrochloric acid liberates the carbonic acid and forms lithium chloride and the latter is not an active uric-acid solvent.

The uric acid in the blood combines only to a very slight degree

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with the lithium; the bulk of it is bound to remain in solution in combination with other stronger bases like sodium and potassium that are always present.

That all this is true, can be demonstrated by a very simple experiment: If we give a small quantity of lithium carbonate by the mouth it appears almost quantitatively in the urine within a short time, not, however, in the form of lithium urate but as lithium chloride. We see, then, the ordinary treatment of the uric-acid diathesis by so-called uric-acid solvents is based on a number of fallacies and inconsistencies; in fact, to this time it has been largely shrouded in empiricism.

The question is, what can we do? And the answer is given in the following arguments: We must first determine what factors are operative to keep the uric acid in solution and we must then attempt to enforce these factors. This point has been made the subject of an exhaustive investigation by Dr. A. C. Croftan of Chicago, and we cannot do better than quote *in extenso* from the Doctor's article, which appeared in a recent issue of the *Journal of the American Medical Association.* Dr. Croftan in this paper explains how the sodium salts of phosphoric acid are concerned in keeping the uric acid in solution; how one series of these salts (the basic salts) dissolve the uric acid with the greatest facility, whereas another series (the acid salts) have a tendency to precipitate it. He puts it as follows:

"Phosphoric acid forms three salts with sodium, namely:

H_3PO_4, phosphoric acid;
NaH_2PO_4, mono-sodium phosphate;
Na_2HPO_4, di-sodium phosphate;
Na_3PO_4, tri-sodium phosphate.

"The mono- and the di-sodium phosphate normally occur in the urine. Uric acid is readily soluble in di-sodium phosphate, but it is not soluble in mono-sodium phosphate. The addition, in fact, of mono-sodium phosphate to a solution of uric acid in di-sodium phosphate will cause the precipitation of the uric acid.

"It is clear, therefore, that the solubility of uric acid in the urine is enhanced by the presence of di-sodium phosphate and that the tendency to the formation of uric-acid concretions increases in proportion to the amount of mono-sodium phosphate that is excreted through the kidneys.

"It is also clear that any endeavor directed toward preventing the precipitation of uric acid in the urinary passages must be con-

cerned with increasing the amount of di-sodium phosphate and decreasing the amount of mono-sodium phosphate.

"The ideal would be to cause the complete disappearance from the urine of mono-phosphate and at the same time to produce the elimination through the kidneys of a quantity of di-phosphate sufficiently large to hold all the uric acid excreted in solution.

"The regulation of the phosphoric-acid content of the blood can be achieved by the administration of calcium salts. For, in the first place, calcium forms insoluble salts with the alkaline phosphates contained in our normal food, and in this way prevents the absorption of this moiety into the blood. In the second place, calcium, owing to the great affinity it possesses for phosphoric acid, combines with the phosphoric acid encountered in the blood-stream, and is subsequently eliminated in the form of calcium phosphate—*not, however, through the kidneys, but in great part through the intestine.* This is an important point, for in contradistinction to sodium, potassium and magnesium, all elements that are chiefly eliminated through the kidneys, 85 to 95 per cent of calcium is eliminated through the bowel.

"It will be seen, therefore, that calcium given by mouth will, first, prevent the entrance of preformed phosphoric acid (phosphates) from the food in the blood, and, secondly, will prevent the phosphoric acid formed in the organism from passing into the urine by causing its elimination through the intestine."

One might ask if the salts of sodium, or potassium, which are also capable of forming basic phosphates in the blood, might not answer the purpose just as well as calcium? But, as Dr. Croftan clearly brings out in his article, there are certain objections to the use of the sodium salts. In the first place, the sodium phosphate, in contradistinction to the calcium phosphate, is excreted through the kidneys and not through the bowels so that only very little would be gained by the administration of these sodium salts, unless so much were given that the gastric function would be seriously injured and the other effects produced that we know to follow the continued excessive alkalinization of the blood and the urine. The urine is normally slightly acid, and it should be kept so, and calcium salts given even in considerable doses never render the urine alkaline. The Doctor summarizes these objections in the following words:

"Whereas, therefore, the administration of large doses of sodium salts for long periods of time may be indicated on theoretical

grounds, it is contraindicated on empirical grounds. First, because it renders the urine alkaline and thus favors the deposit of concretions other than uric-acid stones; second, because it exercises a deleterious effect on gastric digestion; third, because it is not without effect on the corpuscular elements of the blood; fourth, because it is superfluous, as calcium salts, by decreasing the phosphoric acid of the urine, thereby cause a relative increase of the sodium (and of the sodium di-phosphate) without at the same time rendering the urine alkaline."

Therapeutics.—Dr. Croftan advises the administration of the carbonate of calcium to be given in ten to fifteen grain doses two or three times a day, together with a full glass of water. The results obtained from this practice in various manifestations of the uric-acid diathesis, gout, goutiness, rheumatism and particularly in gravel and nephrolithiasis are very gratifying. The results that Dr. Croftan publishes in his preliminary note are as follows:

"I report four cases; they present no clinical features of sufficient intrinsic interest to merit chronicling in detail. The only noticeable fact is that all four were advised by me several years ago to use calcium salts continuously; that all four were lost sight of for periods varying from two and a half to four years, and that all four recently again come under observation for other causes without having suffered a recurrence of their attacks of renal colic during the whole intervening time. Several other cases I have lost track of, but hope to rediscover.

"Von Noorden, who first advocated the use of calcium salts in nephrolithiasis, reports only two recurrences of renal colic among twenty-one cases; in one patient an attack occurred a few days after beginning the treatment; in another patient who had suffered from severe attacks every few weeks, an attack developed nine months after the treatment was begun, and not again thereafter.

"The good results obtained in my four cases and the statistics of Von Noorden lead me to believe that the treatment of uratic nephrolithiasis by the continuous exhibition of calcium salts is efficacious and deserving of extended trial."

This report has been supplemented by the experience of many physicians who verify these findings in detail. In all diseases of the uric-acid type, calcium carbonate (or its compound preparation, Calcalith) has been found efficacious. Such are not only rheumatism and gout, but sick headaches, myalgia, asthma, hay fever, nephrolithiasis, urinary calculi, eczema and other skin diseases,

many nasal and throat troubles and a variety of other affections of this type.

It appears, therefore, that we have here at least a true physiological uric-acid solvent, and that, to judge from the reports of careful, conservative and at the same time scientific clinicians, the administration of calcium salts is of great value in the treatment of this class of disorders.

I have supplemented Croftan's investigations with a sufficient experience to justify me, as above in standing for his findings. I would even go further than he does in my claims for the efficiency of this experiment, but in so doing have added certain synergists and prepared a c. p. calcium carbonate which added to lithium and colchicine makes in Calcalith (Abbott) a remedy which, as an eliminative, is far superior to the plain salt, and the value of which is untold. *It is a true uric-acid solvent, stimulating every excreting organ and is applicable to every manifestation of the uric-acid diathesis.*

CALCIUM IODIZED.

(CALCIDIN.)

Standard tablet—Gr. 1-3, gm. .02.

The names "calcium iodide" and "iodide of lime" have long been known in chemistry and in the schools of medicine, yet these names are loosely used and do not always refer (and never properly) to the remedy to which we refer. This is an important point and must not be lost sight of.

The "iodide of lime," so-called, to which we refer (properly calcium iodized, or iodized lime, or Calcidin, A. A. Co.), is not the chemical crystalline salt, CaI_2; it is not a crystalline body at all and does not contain that definite molecular combination which that chemical formula indicates.

Calcium iodized is an amorphous compound body or substance containing a much larger quantity of iodine which readily separates from its loose combination with the lime, when coming in contact with acids, and thus lets the nascent iodine free to do its absorbing and alterative work.

This salt and its peculiar and specific application to the treatment of true croup was discovered some years ago, and, as it was then erroneously called "iodide of lime," and "brown iodide of lime,"—neither of which it is—it attracted little attention. Owing to this

incongruous nomenclature it was left in its empiricism, and even the few who had learned to rely upon it did not attempt to explain the rationale of its action.

Physiologic Action.—While calcium is a valuable reconstructive it serves here mainly as a base or vehicle for the iodine to which we must look for the explanation of the peculiar therapeutic activity of the compound. The remedial power peculiar to iodine is to stimulate to renewed vitality the absorbent vessels of the body, which have become, either pathologically impaired, or are insufficient in their normal state, to take up and dispose of the adventitious matter which does not belong to the body normally. But the difficulty with iodine is, that it cannot be given in its purity, even in medicinal doses, for any length of time without producing unpleasant sensations in the skin, nose, throat and eyes.

This, however, is less the case in children, who are naturally more tolerant of this remedy and become more and more so under treatment, especially when it is given in the form of an iodide, and above all, when given as iodized lime, very likely because lime is a normal constituent of the body, thus carrying the iodine to it in a more natural and readily assimilable form. However this may be, the fact remains that calcium iodized does not cause iodism, even when given in maximum dosage and for a prolonged period.

Therapeutics.—Croup, that sudden scourge of infancy and childhood, when it is merely spasmodic, that is, when the chink of the glottis is narrowed by a spasmodic contraction of the muscular and other fibers of the vocal cords, while amenable to and well treated by calcium iodized, can usually be overcome by antispasmodics without calcium iodized. Of these, aconitine, hyoscyamine and apomorphine are the best. It is always well, however, to include calcium iodized, for diagnosis cannot always be sure, at first, between the true and the false.

For a child up to five or six years, give about six tablets, gr. 1-3 each, or two to three grains of the powder, dissolved in six teaspoonfuls of water, a teaspoonful every five to ten minutes until effect, or one to three grains, dry on the tongue, following with a draught of water. If for any reason this is not efficient, recourse should be had to apomorphine, (1-16 to 1-12 gr.), hypodermically, attempting to stop at nausea, just short of actual emesis—unless the latter be clearly indicated. In severe cases complicated by "a full stomach," the apomorphine may be given at once with advantage, Cal-

cidin, Abbott, being exhibited in smaller doses as soon as emesis ceases.

But the same croupy cough may be caused by a catarrhal state of the inside of the larynx, tumefying the vocal cords, narrowing the chink between the true vocal cords, thus producing that peculiar "crow" and a moderate amount of dyspnea, which antispasmodics will not permanently relieve. The case may even proceed to an exudation of material capable of forming a membrane not only on the vocal cords, but on the parts above and below them, and the danger of suffocation becomes imminent. It may not be easy in such cases to distinguish between a diphtheritic and a simple croupous membrane, and while we cannot be sure of the efficiency of this remedy in the former—for the simple reason that there we have a specific toxin to deal with—we are sure of it in the latter. Calcium iodized (Calcidin) properly and persistently administered will rarely disappoint, and most frequently it will surprise the physician with the rapidity of its action.

The following is the experience of one physician, as related in *The Alkaloidal Clinic:*

"About seven years ago I first used calcium iodized for membranous croup, since which time all difficulty in curing every case which has fallen into my hands has ceased, and I am firmly of the opinion that nowhere in the domain of therapeutics have we a remedy more deserving of the name 'specific.' *During these seven years I have treated not less than twenty-five or thirty cases of this fatal disorder, true croup, without a single failure and without remaining at the bedside of my patient for a single hour.* Under its use the symptoms quickly improve and invariably disappear, and the patient moves forward to an easy and sure recovery. The dread which I formerly had of this malady has entirely disappeared and I take charge of these cases with as much assurance of recovery as though the little ones were suffering only with measles."

Hundreds of similar reports are conclusive evidence of the value of this remedy in croup.

It is important that no error in diagnosis be made, if satisfactory results are to be obtained from the use of the remedy, for while it is almost certain to cure any case of spasmodic or membranous croup in which it is used within reasonable time, it possesses alone no curative virtues in diphtheritic croup.

Calcium iodized is also praised by respectable authorities as an absorbent agent in cases of uterine fibroids, when given in small

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doses three to four times a day for months, and even for a year. It is also praised as a calmative remedy for the dyspnea that is likely to arise, at night, especially, from heart-disease. So also in the dyspnea of consumptives, and in that of asthma, where it is one of the very best remedies we possess. In fact, it may properly be used in all conditions where the iodine effect is desired; and that it will produce that effect with less irritation and with less expenditure of time than any iodine-carrying agent with which we are familiar, the practician can speedily prove for himself by trying it a few times.

To young infants with the "snuffles," whether due to post-nasal adenoids, hypertrophied turbinates or inherited syphilis, given in doses ranging from 1-2 to 1-3 of a grain three or four times a day, as indicated, it will be found to quickly relieve, and, with removal of cause, will soon effect a cure. In older children with night cough, due either to catarrh of the naso-pharynx, or to clogging of the bronchi in subacute or chronic bronchitis, doses of one-third to one grain, repeated every fifteen minutes for a few doses during the paroxysms will often give relief when everything else fails. Through its alterative action it favorably influences these cases when given continuously three or four times a day.

After grippal attacks, where the bronchial glands are enlarged and there is found upon examination of the throat, a tough, grayish-yellow secretion adhering closely to the folds of the soft palate and to the sides of the pharynx extending into the vault, and in which there is a disagreeable, dry, rasping cough, calcium iodized in doses of one or two grains, dissolved in water, and given every three or four hours, will act promptly and afford relief sooner than any other remedy yet tried. In all catarrhal conditions of the upper respiratory tract it should be one of the main remedies.

In cases of heart-disease in which there are nightly paroxysms of an intense feeling of oppression in the chest, with spasm of the bronchial tubes, suffocation, dyspnea, and an incessant, dry, metallic cough, one grain of calcium iodized every fifteen minutes usually relieves by the time the third dose is taken. The remedy does not influence either favorably or unfavorably the heart lesion.

In the night coughs of tuberculosis it is an invaluable remedy; two or three one-grain doses repeated at half-hour intervals just before bedtime will usually cause the patient to rest well until between three or four o'clock in the morning, when a few more doses repeated in the same manner will bring him comfortably through

the night. It lessens hectic fever, and prevents night-sweats. It may not, however, check or retard the course of the disease, when it has gone to this extent, but in phthisis, generally, its efficiency is practically proven.

In the so-called coughs, due to irritation of the uterus, ovaries or stomach, it gives relief. In whooping-cough in full dosage, one granule after meals, it has proven an excellent remedy. Elimination should be stimulated in all these instances. In this connection attention may be well called to the undoubted benefit derived from the use of calcium iodized in many cases of an autotoxemic character. When the stomach and intestinal walls are flabby, catarrhal and lacking in tone, the administration (after a thorough eliminative course of calomel and podophyllin, gr. 1-6 each, every two hours for a day or two) will bring about a marked change for the better.

Another point worthy of consideration here is the value of calcium iodized in all throat affections causing disturbances of the voice. Singers' sore throat, "clergyman's voice," etc., will one and all be speedily benefited by Calcidin and strychnine arsenate.

From the foregoing it becomes evident that in calcium iodized the practician has:

1. An almost specific remedy for that most distressing malady, membranous croup.

2. An efficient and reliable agent in most bronchial affections, even, through its alterative influence, in reflex conditions, voice disturbances, etc.

3. In dyspnea (whether due to affections of the bronchi and lungs or to cardiac disturbances) it proves of prompt service—as it does also in asthma.

4. It rapidly causes a reduction and gradually absorbs fibroids of the uterus.

5. It is possibly the most rapid and certain remedy for coryza.

6. It enables the doctor to administer iodine in larger quantities for a longer time without causing unpleasant systemic effects.

7. In goiter and all glandular diseases, Calcidin with nuclein will prove probably the most efficient of all known remedies.

The conditions calling for the use of iodine are often the ones which also require the lime salts; the converse is also true; therefore we have in calcium iodized a form of medication which gives not not only the most perfect-iodine effects, but does it without causing the slightest sign of iodism and provides at the same time, in a most acceptable form, the lime salt which is necessary.

CAMPHOR MONOBROMIDE.

Standard granule—Gr. 1-6, gm. .01. Tablet, gr. j, gm. .06.

Camphor monobromide is obtained by the direct action of bromine on camphor. It crystallizes in monoclinic prisms, little soluble in water, sparingly in cold and freely in hot alcohol, easily in ether, choroform, oils, or benzole. The odor resembles that of camphor.

The contradictory reports on this salt appear to show that it acts as camphor and as a bromide, not as a new body. The bromine is not excreted by the kidneys (Liebreich). It reduces the pulse, the respiration and the temperature (Bourneville and Lawson). It produces clonic spasm of the feet, maximal dilatation of the pupils during the spasms; hallucinations, insomnia and emaciation when its use is continued long (Nothnagel). Large doses cause poisoning with the same effects as camphor.

Cushny says it acts as camphor, the bromine having no effect.

Wood says it causes violent convulsions, with muscular weakness almost to the point of paralysis; small doses lowering the temperature after an evanescent rise, with great diminution in the rate of the respiration and of the heart, with occasional periods of hurry in each. Stupor ends in death. The vessels of the eye and ear are contracted. Doses of 45 grains caused tremblings, slow pulse, and coma lasting six hours.

Hare found it caused Cheyne-Stokes respiration, the pulse at first rapid and then becoming slow and weak. Death may occur either in coma or in convulsions.

Van Renterghem experimented on himself with camphor monobromide as follows: The first day he took two granules, gr. 1-6 each, every hour for 10 doses, allowing the granules to dissolve in the mouth. The local action on the buccal mucosa was limited to a sensation of fresh warmth, with salivary and mucous secretion. Next day he took five granules every hour for eight doses. On neither day was there any special symptom that could be charged to the remedy. The appetite was good, the sleep if anything more than usually profound. The third day he took fifteen granules hourly for four doses. Fifteen minutes after the fourth dose he felt a sense of warmth in the face; the forehead, face and neck covered with sweat, the lips pale, with a sense of vertigo and as if being raised from the earth. The pulse was unaffected, the respirations calm. Dinner was then ready but he could not swallow a morsel. This state endured an hour and subsided slowly. Although able to attend to

business it was not till next day, after a good night, that he felt himself as usual and the gastric derangement had subsided. Under the influence of the massive doses his temper was irritable.

Burggræve, taking this agent during a cold in the head, observed after a dose of four granules a diminution of the tactile sense of the pharyngolaryngeal mucosa. According to him, camphor monobromide realizes the ancient saying of camphor: "Camphor dissolves spasms."

Van Renterghem concluded from his trials that in light doses, of two to five granules hourly, this drug is harmless to a well man; while in doses of gr. 7½ hourly, it deranges the stomach and causes intoxication.

Therapeutics.—Deneffe used it in delirium tremens, giving 3 to 4 grams. Hamilton gave it with benefit in chordee; Gallard in chorea; Vulpian and Potain in hysteric spasms, palpitations, dyspnea and spermatorrhea; Charcot and Bourneville in epilepsy; Desnos in prosopalgia; Lannelongue in painful affections of the bladder: Rosenthal in nervous palpitations and excessive irritability of the bladder. Veterinarians have reported success in treating sexual manifestations in the horse, dog, cat and bull.

Landrin found that moderate doses prevented irritation of the urinary apparatus from the absorption of cantharidin from blisters.

Van Renterghem recommends camphor monobromide in the dryness of the tissues in typhus and cholera; in all inflammations of the respiratory, digestive and genitourinary ways; in all cases with tendency to exudation or the formation of false membrane; in irritations of the larynx and œsophagus; in asthma and emphysema, spasmodic and convulsive coughs, whooping-cough; certain cardiac palpitations, nervous or symptomatic of organic lesions; for hyperemias in general and affections of the cerebral nervous centers of congestive form or due to stimulants; for urethral erethism, the debut of gonorrheas with chordee. It is the best sedative of the genital system, for nymphomania, hysteria, pollutions and priapism.

Berger pronounced it of value only in nervous palpitations and in irritability of the genitourinary organs. Rosenthal obtained good results in hysteric and nervous headaches. It has been suggested for paralysis agitans, and Liebreich found it effective in hystero-epilepsy.

Wood found it useful in hysteric excitement, sexual irritation and spermatorrhea, but of little value in delirium tremens; but Hare advises it in the latter when the gastric mucous membrane is de-

pressed and there are violent twitchings. For pain, Hare advised this remedy in connection with others, as in lumbago; also as a hypnotic in hysteria, for whooping-cough, chorea, epilepsy and petit mal, and for the nervous depression and pains of influenza. Like camphor, the monobromide warms and in overdoses irritates the stomach.

Bourneville recommended it in vertiginous epilepsy, but not in the ordinary forms.

In many cases it seems a question if any sedative can be used, and yet there are irritative symptoms that need sedation. The combination of a calmant with a powerful restorative like camphor is admirably suited to this indication, and the monobromide of camphor has won laurels in many such instances. The insomnia of fatigue, and that of nervous exhaustion, are usefully treated by this agent in doses of seven grains at bedtime, or a grain every quarter-hour till effect. For such conditions in children it is simply admirable. It does not usually irritate the stomach as crude camphor does; in fact, the writer's experience directly contradicts Cushny's statement, for if either ingredient is covered up, it is the camphor. In fact, in many cases, giving this salt for acute colds, the desired camphor effect has not been obtained.

As a sexual sedative it is far more reliable than camphor, which is as liable to act as an aphrodisiac as the contrary, but the monobromide has never failed to give pure and unmixed sedation of this function.

Even in irritable conditions of the stomach this remedy has not caused distress or nausea, in the small doses deemed advisable then. A granule of gr. 1-6 may be administered every five minutes for an hour or two, when a single dose of five grains would possibly cause trouble.

Children with whooping-cough take two to five grains at a dose without irritation, and here it has proved in our hands a valuable sedative for the cough, though not shortening the attack as calcium sulphide or formalin will do. The camphor bromide does not have the injurious effect on the digestive organs, or the depressing effects on the vitality, that are sure to follow the prolonged use of the potash bromide. In fact in children and delicate females, the latter in our practice has been entirely superseded by the camphor bromide.

If the temperature falls below the normal the administration of camphor monobromide must be suspended. It is too irritating to be

used hypodermically, but if this should be deemed necessary the solution in oil could be utilized, the dose being 1½ grains.

CANNABIS INDICA.

Standard granules—Cannabin resin, gr. 1-67, gm. .001; cannabin tannate, gr. 1-67, gm. .001; cannabin and atropine comp. (Cannabin, gr. 1-50; atropine sulphate, gr. 1-100.)

The use of this drug as an intoxicant, hypnotic and aphrodisiac in the East has invested it with unusual interest. Under the names of hasheesh, bhang and gunjah it fills with many races the places of opium and tobacco, and of alcohol. But though it has frequently been introduced into medical practice it has never sustained the place for which it was urged, or dislodged the more objectionable agents for which it has been proposed to substitute it.

No drug would seem better calculated to display the advantages of Alkalometry than this, because it possesses exceedingly valuable properties but is scarcely used, on account of the uncertainty and unreliability of its preparations. But up to the present it has defied all efforts to find an active principle, from which its remedial virtues can be obtained.

Merck lists cannabin, a resinoid; cannabindon, a liquid, dose m. ⅓ to 1; cannabine alkaloid, dose gr. 1½ to 4; cannabine tannate, dose gr. 8 to 16, maximum daily, gr. 40; cannabinine; cannabinon, dose gr. ½ to 1½; and an alcoholic extract, dose gr. ¼ to 2, maximum daily gr. 5.

Cushny pronounces all the above merely impure extracts. Hay reported the discovery of tetanocannabine, with effects similar to those of strychnine; but this has not been confirmed. Vignolo says cannabis contains muscarine, and traces a similarity of effect with the mushrooms used in Russia to produce pleasurable intoxication.

A good extract like Allen's gives therapeutic effects in doses of gr. ¼ to ½. It is obvious that no derivative requiring doses in excess of these can be looked upon as the active principle. The extracts vary greatly, and every new sample requires testing anew. But the drug is worth it; as we hope to show.

Physiologic Action.—Brunton pronounces cannabis hypnotic and analgesic. In some it causes visions or hallucinations previous to sleep, of pleasant nature or otherwise. It is not an aphrodisiac, but gives rise to erotic dreams or hallucinations, more frequently in Asiatics than in Europeans. Sometimes it causes delirium, or tendency to active movements, sensible or erratic, rarely

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homicidal. In Europeans the dreams may be disagreeable. In Asia it is the custom to give other aphrodisiacs with cannabis to give the visions this coloring. The patient under its influence may talk and act apparently in a sane manner, while really not so. In some cases there is a curious loss of the sense of time and space, so that ages apparently elapse in a moment. In others the phenomenon of double consciousness is presented, the two sides of the brain appearing to act independently. Given short of hypnosis a dreamy state supervenes, the judgment being in abeyance, the imagination free. The visions and speech may show boundless extravagance, but vary with the individual. The movements may be absurd, the ideas incoherent; there may be a sense of impending danger or death, or the condition is of euphoria, comfort, well-being, self-satisfaction. Consciousness is not all lost but restraint is weakened or lost. When aroused or questioned the answers may be rational. The sense of pain is weakened or lost, that of touch lost. In some this pleasant stage is absent and there is merely a heavy, drowsy feeling, with tinnitus, and numbness. Some experience a sense of fullness in the chest, as if it were bursting. Heaviness of the arms and legs may be felt, the head hot and heavy, the eyes bright and shining, dizziness, noises in the ears and pleasant anesthesia. Pressure excites a sense of burning. Rarely it causes maniacal attacks or convulsions. Periods of unconsciousness alternate with the foregoing, and finally deep and healthful sleep supervenes. Some say sleep is secured in only fifty per cent of cases, but this is too little, in our experience.

From this sleep the patient awakes refreshed, with no headache or disturbance of the digestion—no nausea or constipation.

Cannabis affects the nervous centers like morphine, with a mixture of sedation and stimulation. The respiration may be accelerated or slowed, the action on the pulse also being irregular, first faster, then slower. The temperature may be raised or lowered as motion is or is not induced, falling as sleep comes on. The sensory nerves are benumbed, the pupils dilate. The legs especially become anesthetic. Large doses, however, slow the respiration quite uniformly. Death from cannabis is very rare; Hare says none has ever been reported.

The nutrition is not affected by the habitual use of this drug. Shoemaker says it causes mental deterioration and unfitness for work. In the East the use is said to lead to dementia or mania.

Locally cannabis is an irritant to muscular tissue, anesthesia fol-

lowing; but the irritation is too great to allow its use as a local anesthetic.

Cannabis increases the excretion of urine.

Therapeutics.—Cannabis covers a large field. Brunton recommended it as a hypnotic in acute and chronic mania; as an analgesic in neuralgia, migraine, etc.; to relieve spasmodic coughs, and for menorrhagia. For constant headaches, from cerebral tumors and other causes, this author recommends it. It relieves the tremors of senility and of paralysis agitans; the lightning pains of locomotor ataxia; gastralgia and enteralgia—in fact Germain Seé pronounced it a specific for pains below the diaphragm. Even the agonies of renal and hepatic calculi are eased by cannabis, as well as those of rheumatism, gout and cancer. It relieves the delirium of softening of the brain, and a dose at bedtime puts a stop to unpleasant dreams. Taken internally it stops the itching of eczema as well as senile and many other forms of pruritus; but a caution as to the formation of a cannabis habit is here necessary.

Pains in the uterus are relieved by cannabis, while its contractions are increased and steadied; in which we may find a reason for the use of this agent in uterine hemorrhages, both menorrhagia and metrorrhagia. It relieves the headaches and checks the hemorrhages of the menopause, and in fact is vaunted as a general hemostatic.

Does it cure diabetes? Probably not, but at least it relieves the attendant cerebral irritation and the itching.

It has been praised as a remedy for asthma, whooping-cough and hay fever; for tickling in the throat, and for the cough of advanced phthisis, where it enables us to long postpone the resort to morphine.

Seé particularly recommended cannabis as a sedative in gastric cases with pain, acidity and flatulence; also in gastric ulcer. In pain from nerve disturbance Hare advises it; as in migraine, giving first a full dose of gelsemium and then cannabis; also in true migraine with hemianopsia which it aborts very effectively. He suggests it in paralysis agitans, spasm of the bladder, and in inorganic impotence, in headache from retinal asthenopia, in subinvolution and chronic metritis, in nervous and spasmodic dysentery, and for chordee. In acute and chronic nephritis it relieves the hematuria and the pain.

Murrell testifies to its benefits in sick headaches.

Cannabis has been used with asserted success for exophthalmic goiter.

Shoemaker advises it as a hypnotic for acute dementia from anxiety, and for melancholy; also in delirium tremens. He mentions its use in tetanus and in epilepsy.

Cannabis has been used in the treatment of opium and other habits, with some success. If the narcomania cannot be entirely cured, it is unquestionably better that the patient should substitute the cannabis habit for any opiate; but in all the cases in which the writer tried to do this he failed. The patients quite willingly added this to their other accomplishments, but there they quit.

In the latter stages of incurable phthisis, cancer and other painful affections, the greatest relief ensues from the formation of the cannabis habit. In painful affections of the heart, such as angina pectoris, the pain-relieving and muscle-steadying effects noted in uterine maladies might be duplicated.

The full adult dose of a good extract is gr. ¼. This may be repeated every hour till effect. With children the dose should follow the opiate rule, being relatively smaller than for adults. A granule of gr. 1-6 for adults and gr. 1-67 for children would meet the needs.

If the use of cannabis is followed by delirium it should be combined with veratrine, or with cicutine if movement is prominent. The hypnotic effect may be developed by adding a moderate dose of hyoscine, or of camphor monobromide. For its anodyne effects the addition of menthol for the stomach, hyoscyamine for neuralgia, acetanilid for headache, should prove effective. In fact, this is an admirable ingredient in the hands of the man who knows how to mix drugs to get their combined effects.

CANTHARIDIN.

Standard granule—Gr. 1-5000, gm. .00012.

Cantharidin, C_{10} H_{12} O_4, constitutes from 0.3 to 0.5 per cent of cantharides, from which it is extracted by chloroform. Cantharidin is the anhydride of cantharidic acid, and crystallizes in rectangular, colorless plates, slightly soluble in water or in cold alcohol, readily soluble in hot alcohol, in ether, chloroform or fatty oils. By taking up water cantharidic acid is formed, which unites with alkalies to form water-soluble salts. Cantharidin is by preference excreted by the kidneys.

Physiologic and Toxic Actions.—Liebreich attributes to cantharidin the essential effects of cantharides. He attributes the special effect of cantharidal vesication to the cantharidin absorbed. The

salts in solid form are liable to decomposition, but potassium or sodium cantharidate can be administered by the stomach or hypodermically, in weak alkaline water solution.

Animals can be fed with hypo-toxic doses for months without perceptible ill-effects. If the dose be increased but still kept below the toxic limit, the kidneys become soft, not hyperemic, serum-soaked, showing that the capillaries allow transudation of serum to an abnormal degree. Cantharidin has then a special action on the capillaries.

Are these merely passive channels for fluid- transmission, or have they a special function like other body-cells? Heidenhain showed that the capillaries can be specially influenced by chemical substances. At any rate, cantharidin coming in contact with the capillaries causes them to exude more serum. It may be inferred that the capillaries of each different organ functionate in their own special manner. As cantharidin in larger than the usual doses causes an excessive transudation, it may be assumed that in smaller doses it has a similar though imperceptible effect. If any organ is so diseased that the serum-secretion of its capillaries is impaired. cantharidin may tend to restore normal secretion, even in doses as yet too small to affect the kidneys. This increase of serum-excretion necessitates a large supply of nutriment to the affected cells, so that the latter are strengthened. Hence, cantharidin is useful when disease is due to external action, or to affections of the tissues. This explains the general tonic action previously observed as following the use of cantharidal blisters. This is especially the case when microörganisms attack the tissues, weakened by previous disease or traumatism. Pulmonary tuberculosis is especially a fit example. Petteruti reports three cures by cantharidin.

When toxic but not lethal doses are taken they cause gastric burning and pain, great thirst, the salivary glands swell and discharge freely, the pulse slows, diuresis and diaphoresis appear, with strangury, tenesmus and diarrhea. The symptoms disappear in twenty-four hours, leaving no ill trace. In severer poisoning nausea and vomiting occur. The appetite may become ravenous, the pulse irregular, filiform and rapid. Urine is increased, with pain and strangury between micturitions, increasing as the urine becomes bloody, with leucocytes and fibrinous coagula moulded on the bladder wall. Consciousness is unaffected, but there are trembling and perhaps convulsions. Even here recovery may follow rapidly.

In fatal poisoning there are acute gastritis and enteritis, spasm

of the œsophagus, dysphagia; drinking is impossible as in rabies and atropine poisoning (Nothnagel); there is vomiting and violent diarrhea, bloody dysentery, the urine suppressed. Cantharides does not excite sexual activity, the severe priapism, turgidity and even gangrene of the penis, being in no sense pleasurable. In pregnant women it may cause abortion, without exciting sexual desire. Some authors fail to comprehend that irritation of the sexual organs is not the same as stimulation of the sexual sensation. A blister on the glans would not accomplish the latter object. These symptoms are most frequently the result of cantharidal blisters. Large doses of cantharidin taken internally cause burning in the urethra and albuminuria. The latter often follows fly-blistering (Gubler), ceasing when the application is removed.

Small animals given cantharidin 0.01 (gr. 1-6), presented glomerulo-nephritis, the cells of the tubuli uriniferi congested, with hemorrhages in the renal and tubular tissues.

Nothnagel says pure cantharidin acts on the skin in doses of 0.00002 in twenty minutes or less, the action occurring more promptly when oil is used as a solvent. If a spot on a rabbit's skin is painted with cantharidal collodion daily for two weeks the usual phenomena of blistering ensue, then the underlying vessels dilate, but the fat disappears; the deeper tissues, muscles, pleura and lung become anemic (Zuelzer).

Nothnagel attributes the affection of the genito-urinary tract to the local action of the cantharidin excreted by the kidneys.

Schachowa noted the presence of numerous bacteria in the urine when toxic doses were given, and these persisted until death. The reaction was alkaline. Fat appeared on the eighteenth day of the continuous administration. Albuminuria occurred only on the third day and not afterwards. He found the alteration limited to the epithelium of the tubuli uriniferi, which was discharged as epithelial and fatty casts. The glomeruli, capillary network, connective stroma and membrana propria were unaffected, save for slight thickening of the latter from maceration with serum. Small doses are excreted by the spiral renal tubules; larger by the part nearer the glomeruli and by the convuluted tubules, the part nearest the glomeruli functionating last. Only when the largest doses are given are changes observed in the rest of the uriniferous tubules, and least in the collecting tubes (Langhaus-Schachowa).

Radecki found large doses cause headache, formication, later on

stupefaction, dyspnea, central respiratory paralysis, and death after general spasms, by carbonic acid poisoning.

Dragendorff recovered cantharidin from the putrid body of a cat eight days after death. Muscular tissue from chickens fed on cantharidin killed a cat with the characteristic symptoms.

Brunton states that cantharides affects the trachea and larger bronchi, causing congestion and irritation. It appears, therefore that cantharidin is eliminated by all the mucous membranes, as vesication in the alimentary tract has been found even when the drug is administered hypodermically (Cushny).

Therapeutics.—In doses of one minim of the tincture, cantharides checks hematuria; in large doses it increases the disease (Brunton).

In acute nephritis, when the acute symptoms pass and a little albumin and blood are still to be found in the urine, it is very useful in doses of one to three minims, every three hours (Brunton).

In lupus, cantharidin was injected hypodermically by Liebreich, curing incipient and lighter cases completely. In other cases where nutritive disturbances were marked, this agent acted beneficially. Its use must be methodical. It is contraindicated in renal disturbances, but if the kidneys are sound the drug may be given for years without disturbing them or causing any other observable ill-effect. The dose accurately fixed in any given case, may be administered for years without alteration, though the least increase is ill borne, producing dysuria and diarrhea.

In cystitis when there is inability to retain the urine, and in ordinary incontinence of urine, it is useful, though atropine is generally better (Brunton).

Chordee is often relieved by a drop of the tincture three times a day (Brunton).

Cantharides, one part of the tincture to eight, is a useful lotion for promoting the growth of the hair (Murrell).

Large doses are useful in impotence of elderly men (20 minims thrice daily, after meals), but accessory treatment is desirable (Murrell). This is a very dangerous dose.

Small doses cure the slight incontinence of urine in women, with cough (Murrell).

In doses not exceeding 0.12 to 0.18 c. c. (m. 2 to 3) the tincture has been commended in pyelitis, cystitis, gleet and leucorrhea. It is contraindicated in acute inflammation; it has succeeded in atonic amenorrhea, and has suppressed passive atonic seminal emissions;

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there is some evidence to show that the internal administration may check the progress of cancer (Shoemaker).

Full doses are useful in impotence from old age, sexual excess or masturbation (Ringer).

In simple and tubercular laryngitis potassium cantharidate causes serous exudation, which is speedily reabsorbed. Hoarseness diminishes and swallowing is easier (Liebreich).

Hennig applied cocaine cantharidate locally in tuberculosis, ozena, and mucous syphilis; three to six parts in 2,000 of chloroform water.

Cantharis has been given internally as a systemic stimulant after debilitating fevers (Shoemaker).

In late stages of nephritis, with relaxed, torpid kidneys, or where albuminuria comes after slight exertion, tincture of cantharides 0.05 (m. 1) thrice a day, is of great service; also in chronic alcoholic nephritis, irritability of the bladder in women and children with depression, very chronic gleet and prostatorrhea; internally in psoriasis, eczema, lichen and prurigo (Hare).

Its administration in cholera and epilepsy has fallen into complete disuse.

Diabetes insipidus has been arrested by the internal use of cantharides; it is also useful for menorrhagia in weak women (Butler).

It is of some benefit in dropsies, especially following scarlatina; in the later stages of diabetes, and in acne with uterine irritation (Ellingwood).

A careful study of the literature of cantharides shows that the active principle is largely excreted by the kidneys, to a less extent by the gastro-intestinal mucosa and slightly if at all by the respiratory mucosa. I have been unable to find any conclusive or even probable evidence to show any action whatever apart from the local effects produced on the mucous surfaces and other tissues by which the drug is excreted. The therapeutic effects are therefore to be exclusively attributed to this local action. Even the succulence of the tissues described by Liebreich comes under this head, and he describes none of this beyond the excretory membrane. In states of relaxation and debility of the genitourinary organs we may expect from cantharidin the same stimulant effect exerted on a cutaneous ulcer by a weak solution of silver. This applies also to the uterus, and the endometrium probably excretes and is stimulated by cantharidin. To a less extent the lower bowel is similarly affected by

this agent, and in relaxation of the rectal tissues, prolapse and passive hemorrhoids, chronic catarrh and ulcer of the rectum, cantharidin would be a useful stimulant if the dose required does not prove too irritant to the urinary mucosa. Consequently I very strongly doubt if doses large enough to favorably affect the respiratory mucosa can be given without harm to the kidneys, since very little of the drug is excreted by the lungs. Beyond these organs I am unable to find any reason for the administration of cantharidin.

In regard to its effect as an aphrodisiac the evidence is conflicting. Most authors deny that there is any excitation of the sexual appetite, the priapism being only caused by toxic doses, and as a symptom of serious poisoning. I have given the drug many times in moderate doses without eliciting the slightest pleasant sexual sensation; and in the only cases where erections were produced the suffering was too great to admit of any thought of pleasure. When impotence is attended with relaxation of the genitourinary tissues, moderate doses of cantharidin may be useful in imparting tonicity, and the drug may be of some value as an adjuvant to strychnine, but nothing more; and of the two strychnine is preferable, since there will be also then present atony of the whole body, including tissues not influenced by cantharidin. And it would not be politic in such cases to restore the strength of this function while the more vital processes are left in a state of debility.

Cantharidin must be looked upon as a highly specialized weapon, delicate and keen-edged, capable of doing much good in a limited group of affections, but dangerous in unskilled hands. It is strictly a drug for dosimetric administration, and should never be given in rare large doses, but in minimal quantities rapidly repeated, until the beginning of burning in stomach or urethra shows the physiologic limit to be reached. And as many of the beneficial effects of fly-blisters are due to the cantharidin absorbed, the internal administration may well replace the blister in many instances.

We here meet the same cogent query as in the case of arsenic. Having determined that cantharidin exerts its power upon certain selective cells, in the physiologic state, as above shown, is this power exerted curatively upon these cells when diseased? Were our knowledge complete of the intimate nature of disease-processes, as affecting each tissue, each variety or group of cells, this question might be answered *a priori*. As it is, the only way to determine the truth is by actual trial. There is here room for very extended experimentation, to confirm or disprove the clinical observations of

earlier days, when medicinal agents of uncertain and shifting strength and composition were employed, and the difference between *post hoc* and *propter hoc* was little regarded.

Especially I would recall attention to the claim recorded by Shoemaker, of the arrest of the growth of cancer by cantharidin. This is too important to be permitted to go without investigation. As in lupus, when the cancer is within reach it would be best, perhaps, to inject the solution hypodermically into the neoplastic growth. For this the combination known as cocaine cantharidate is suggested. This is said to be a mechanical mixture like caffeine citrated, not a chemical union; but the resultant mass is freely soluble in water, which cantharidin is not.

As to the value of potassium cantharidate in tuberculosis, Nothnagel condemns it; but condemnation is habitual with this writer, who rarely finds good in any remedy. Petteruti's three cases were abandoned by him as failures, but on examining them some time later he was surprised to find them cured. A true pessimist would not have made the final examination but suffered the cases to go on record as failures.

Liebreich gives the dose of cantharidin as 0.0002 to 0.0008 (gr. 1-667 to 1-167), well diluted. Sodium cantharidate is injected into patches of lupus. Dose 0.0001 for adults, every other day, suspended if diarrhea or dysuria occurs.

Dietrich's cantharidin oil is composed of one part cantharidin, 960 parts of olive oil and 40 of acetone.

Schroff fixed the lethal dose of cantharides for man at 2.0 (gr. 30), but of course the toxicity of various specimens varies greatly.

For use by the dosimetric method the adult dose may be placed at 0.00001 (gr. 1-6000) repeated every hour until slight burning is felt in the stomach or urethra.

CAPSICIN.

Standard granule—Gr. 1-134, gm. .0005.

Some day we will realize the importance of that great aggregation of nerve ganglia to which Byron Robinson gave the name of the Abdominal Brain; and when we do the value of capsicum will be also appreciated. The Eclectics have done so, and the rich therapeutics ascribed to this remedy by them contrasts notably with the poverty of the same as found in our own works.

Capsicum contains a crystalline principle on which its activity depends, but probably the most efficient concentration to be found in the markets is the oleoresin, which is active enough for all practical purposes.

In all tropical countries capsicum is used as a condiment, or rather as a dietary article of daily consumption, in quantities that would appear fabulous to the resident of colder lands. That there is a reason behind this no one will deny; but whether it is because the climate renders advisable an equalization of the inner and outer heat, or the digestion fails without such powerful stimulus, or that it acts as a check on the growth of gastric flora and fauna, is a matter of conjecture. Certain it is that the Caucasian removing to the tropics soon falls into the ways of the country and takes his *chile con carne,* hot tamales, curry, and other hot concoctions like the native.

But whether this practice does or does not conduce to longevity in the native or habitant of the tropics, it is certain that here it is calculated to wear out the digestive functions and shorten the working life of the stomach and liver. The writer recollects a well-known citizen of an eastern city, who was accustomed to call at the restaurant for a steak, which he would punch full of holes with an instrument he carried for that purpose, and fill the holes with capsicum till the quantity almost equaled that of the meat, and then eat it.

If the digestion requires the stimulus of capsicum, it requires still more the attention of a physician who understands the digestive system, if such an one may be found, and a really scientific regulation of diet, exercise, and the personal hygiene in general. But it seems preferable for the multi-millionaire to resort to tabasco. Well, if this shortens his life, we see in this another exemplification of that law of compensation of which the world shows so many cases.

Fifteen years ago three men, physicians, were rivals in their spheres, as professors of the same branch in three medical colleges in one city. One recognized when he had enough, and drew out, leaving the field to his victorious rivals. They are dead; have been for years, while he still lives and enjoys health and we trust usefulness.

Which was victorious?

The most important function of capsicum, and the least appreciated, is as a stimulant to the solar plexus, rousing the vitality and awaking the vital resistance to the onslaught of disease. In the

collapse of choleras, the chill of malarias or other sudden and powerful infections, in the algid stage of tropic dysentery, the influence of a decided dose of capsicum thrown into the stomach is something to be appreciated when once seen.

What is the physiologic effect? In small doses it is followed by a sense of warmth in the stomach, the secretion of gastric juice is stimulated, and all the digestive functions aroused. Of course the repetition of this in time wears out the susceptibility of these organs, they cease to secrete without the capsicum, and gradually it loses its effect, so that the digestion is worn out.

In very large or toxic doses capsicum causes vomiting, giddiness, purging, pain in the stomach and bowels, acute gastritis, and intoxication, with feebleness of the nervous powers.

The dose necessary to produce such effects depends largely on the patient's habits. If his stomach has been seared by long indulgence in stimulants or condiments, it requires very large doses; if unaccustomed to them, we should be cautious in administering the doses hereinafter recommended.

Therapeutics.—The list of affections for which capsicum has been recommended is long.

Colds: Capsicum in hot infusion is one of the domestic remedies to break up a cold. It ranks with the hot toddies, etc., and is open to the same objections that they increase the vascular pressure and thus add to the hyperemia of the affected tissues. The use of the depleting method, abstracting fluid by glycerin from the swollen tissues directly, or from the blood by eliminants, will soon prove itself the better way. But when one has been exposed to cold while riding, and comes into the house chilled, a bowl of red pepper tea will arouse the vital resistance and send the blood equally through the vessels and prevent a threatened congestion, as well as any other stimulant, and better than an alcoholic beverage.

In catarrhs of the pharynx the use of capsicum as a gargle is of value in arousing the diseased and weakened tissues to a healthier grade of action. The same remedy has proved effective in relieving hoarseness.

In atonic dyspepsia and chronic gastric catarrh, capsicum in small doses is a valuable stimulant, and aids the digestion while other measures are restoring the strength.

In delirium tremens capsicum, in doses of twenty grains to sixty, will do more to secure sleep and restore the nervous system to its balance than any of the direct hypnotics, singly or combined. In fact,

the use of capsicum was the writer's main reliance until the true treatment of this malady by elimination was comprehended. When a man is crazy for drink, insisting on repeated drams till drunk, hardly waiting till one is down till calling for another, give a teaspoonful of capsicum in an ounce of whisky. It will divert the mind into a different channel—mainly that of swallowing ice—and instantly stop the calls for alcohol. From this huge dose we have never known harm, but of course it has only been called for in inebriates, whose stomachs were well prepared. But the administration of a grain of emetine is better, if the patient can be kept quiet till it puts him to sleep.

In the algid forms of malaria, congestive chills, a full dose of capsicum will do more than any other remedy to arouse reaction. It will require but half the dose of quinine, or less, to do the work when capsicum is added.

The atonic dyspepsia of drunkards is usefully treated by capsicum, taken freely as a condiment. Here the effect is partly due to the stimulation of digestive secretion, partly to relief of the tormenting thirst, and partly to a direct action of the drug in stimulating the nervous system. There is also an effect on the liver that is of value.

In chronic congestion of the kidneys capsicum is said to diminish the irritation and increase capillary activity; but here the writer has had no experience. When the kidneys require stimulation of the dialyzing membrane it unfortunately happens that they will not bear it. Very small doses of any volatile oil, like juniper, will increase the excretion, but if the dose is increased the excretion at once falls off in a disquieting manner.

In passive diarrheas, and when a general stimulant is indicated, capsicum carefully given is very beneficial.

Torpid, sluggish forms of piles are helped by capsicum, which arouses a healthier circulation.

In all the formulas for chronic or habitual constipation capsicum forms a useful ingredient, aiding to arouse a healthier state of feeling in the intestinal mucosa, and rendering other remedies more effectual.

In dysenteries with vesical tenesmus, laxity and weak digestion, capsicum has been found beneficial. It is of course not suited for the acute stages, where the indication is to sedate abnormal irritability; but when the tissues threaten to fall into sphacelus from the

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intensity of the infection, or when the malady continues from deficient vitality, capsicum is the most potent remedy.

The same may be said as to its use in low fevers. If the vitality were sufficient the tissues would throw off the disease and take on reparative action; and then capsicum may succeed in arousing the remaining forces. It is obvious that the condition should be thoroughly comprehended before such a remedy is administered. The man who assumes that capsicum is "good for dysentery" had better let it alone.

In organic paralyses with digestive torpor the use of capsicum improves the digestion, and this reacts on the paretic affection in a way that has given the treatment repute, with those who do not appreciate the value of a good food supply, well digested, and the prevention of autotoxemia, in such cases.

The solar plexus stimulation is nowhere shown to better advantage than in the group of choleras, Asiatic, morbus and infantile. When the stage of collapse has supervened, nothing equals capsicum in arousing the vitality and restoring warmth to the skin. Full doses must be given, the tincture, undiluted, being advisable. For here the admonition of the Hindoo doctors is wise—if you can give a dose strong enough to bring the tears to the eyes the patient will be saved. And this principle comes in as applicable to the first onslaught of the malady, as well as in dysenteries and the chills of opening fever attacks.

The same is applicable to angina pectoris, whose paroxysms may be broken by a single dose of capsicum if strong enough. The timid practician is out of place here—it is the sledge-hammer blow alone that will save life.

In the debility of advancing age, with tired, aching muscles, stiff joints and general relaxation, capsicum is of much value. Here is the place for it as a condiment, for those who have wisely refrained from its use in earlier days. Give enough for the work.

In pneumonias, debilitated cases, where there is a threatening of the affected pulmonary tissues falling into abscess, capsicum in large doses may arrest the process.

In flatulence, capsicum should be added to the aloin, strychnine, eserine or berberine, and from these an effective formula may be made up.

In some cases of persistent vomiting, it seems as if the stomach requires a lesson—for in what other way can we explain the credit the following "antiemetic drops" possess? One-half oz. powdered

capsicum, two drams of salt, ½ pint each of vinegar and water; dose a tablespoonful.

In various spasmodic maladies capsicum has proved effective; full doses with as little dilution as possible are best.

For passive hemorrhages, especially uterine, capsicum has been advocated; and associated with ipecacuanha in postpartum cases.

Locally, capsicum has been recommended as a gargle in scarlet fever and in chronic tonsillitis; as an application to stimulate sluggish ulcers; for chronic ophthalmia, where the use is as apt as that of abrus (jequirity), and indubitably less dangerous; for corneal ulcers, where the vitality of the tissues must be sustained at any cost; to abort acute tonsillitis, used very early; for the hoarseness of atony of the vocal apparatus; for relaxed uvula; chilblains; toothache; cold feet; in any case where it is advisable to stimulate the vitality, or to increase the action of other drugs—the latter applying to local or internal use equally.

The specific indications for the use of capsicum are thus summed by King: Great depression and debility; atonic dyspepsia of drunkards; delirium tremens; colic with flatulence; congestive chills; cold feet; white lips, small pulse, capillary atony, tongue dry; chronic hemorrhoids.

For most of its uses the oleoresin of capsicum is eligible; in doses of gr. 1-20 to a grain, before meals or as indicated. When it is desired to powerfully affect the stomach and solar plexus, as in congestive chills, a grain or more may be given in a teaspoonful of alcohol. For cold feet powdered capsicum may be put in the stockings. The red pepper of the grocer is rarely if ever undiluted, and that of the pharmacist is not much better. If the physician will take the trouble to secure a supply of a pure article he will be surprised to find what a difference exists.

CAULOPHYLLIN.

Standard granule—Gr. 1-6, gm. .01.

Caulophyllin is a concentration from the rhizome and roots of Caulophyllum thalictroides, the blue cohosh, squaw root, or papoose root.

The virtues of this plant depend on a crystalline glucoside isolated by Lloyd, and by him named leontin. It is slightly soluble in cold and very soluble in hot alcohol, insoluble in water or in chloroform. Alkaline watery solutions dissolve it perfectly. The

solutions are acrid and irritating. Of the caulophyllin of the market Lloyd says: "Like nearly all the so-called concentrations and resinoids of early Eclectic preparation, while they were better agents than preceding pharmacal products, yet at the present time they are too uncertain in composition and medicinal value to hold a leading place among our more modern therapeutic preparations." And that tells the story of the alkaloids, which, however, this great chemist is not yet ready to accept.

Therapeutics.—Caulophyllum was introduced by Rafinesque as a powerful emmenagog; the Indians used it in rheumatism, dropsy, colic, sore throat, cramp, hiccough, epilepsy, hysteria, metritis, etc. King applied it for aphthous stomatitis. Scudder believed it influenced the hypogastric plexus, affecting the circulation, nutrition and functions of the reproductive apparatus. Lloyd describes it as antispasmodic, diaphoretic and diuretic, expectorant, emmenagog and parturifacient. The Indians gave it some weeks previous to confinement to facilitate labor. During labor it relieves false pains and coördinates true ones, increasing their force. It is a better oxytocic than ergot, stimulating normal contractions instead of inducing spasmodic action. It is best when delay is due to debility, fatigue or lack of nervous energy, and when with weak pains the tissues feel full and congested. He advises it for several weeks before labor, for delicate women or those who have prolonged and difficult labors. Hale says those who take caulophyllin thus may overrun their time by 12 days, but have very easy labors and make good recoveries.

Felter and Lloyd enumerate the following conditions in which caulophyllin gives benefit: After-pains, especially spasmodic; hourglass contraction, spurious labor-pains; antiabortive by relieving the irritation on which the trouble depends; irritation of the reproductive organs resembling congestion, chronic inflammations and debility; uterine tenderness and pain with debility; to overcome attacks of hysteria, relieve ovarian or mammary pain, or irritation, in hysteria; chronic endometritis or metritis, ovaritis, ovarian neuralgia, uterine leucorrhea, amenorrhea and dysmenorrhea; uterine rheumatism with nervous excitement, menstrual cramps and menorrhagia due to subinvolution; chorea and epilepsy with maladies of the sexual organs, flatulent and spasmodic colic, cramps; obstinate hiccough; its antispasmodic effects are permanent; lessens irritation in cystitis, urethritis, chronic nephritis, spasmodic retention of urine, when crampy pains in stomach follow eating in rheumatics; rheumatism of small joints, asthenic plethora and its rheumatic

pains; insomnia, bronchitis and catarrhal pneumonia as a sedative: orchialgia; gastric nausea and vomiting. Leontin has been used with benefit in the amenorrhea and dysmenorrhea of chlorosis.

Specific Indications.—Uterine pains, fullness and weight; pain in legs; fullness of tissues as if congested; irritable debility of the nervous system with muscular weakness; spasmodic muscular pains, articular pains, rheumatic pains of asthenic plethora, epigastric and umbilical colicky pains; dull frontal headache; great thirst; as an oxytocic; false pains and uterine irritability; sexual erethism; spasmodic uterine contractions; dysmenorrhea; irregular menstruation; stomach cramps after eating; pain in toes and fingers not due to tissue changes.

Ellingwood says this remedy must be continued long to obtain its benefits. The last three months of pregnancy constitute its great field.

Gestation being prolonged the fetus is fully developed and labor normal. He gives caulophyllum with confidence for the amenorrhea at the beginning of menstrual life; to control congestion in whooping-cough; moth patches on the face; rigid os; atonic hemorrhagic tendency after labor; dysmenorrhea or lack of development; dropsy with menstrual disorders. It is given every ten minutes till labor pains become sufficient.

Dr. E. J. Meacham verifies these statements as to the value of caulophyllin in labor, and tells of a case in which there was active labor with the soft parts hard and resisting dilation. It was a primipara. He gave caulophyllin gr. 1-6 every fifteen to thirty minutes and soon found the os soften and dilate.

The eclectic school is practically unanimous as to the value of this drug, and as to the conditions in which it is indicated. It seems unlikely, to say the least, that all this testimony is mistaken and that caulophyllin is unworthy a place in modern medicine. Cushny attributes any virtues it may possess to its saponine and Shoemaker refers to this agent some expectorant properties which he attributes to blue cohosh. The limited uses made of caulophyllin by the writer have been sufficient, however, to convince him that it is an active agent and so far as this experience goes, to confirm Ellingwood's recommendation. The concentration caulophyllin fully represents the plant's therapeutic powers, though leontin should be still better if it can be procured and handled commercially.

In acute conditions caulophyllin should be given in doses of gr.

1-6 every ten minutes, dissolved in hot water, till effect. In chronic conditions give a grain four times a day, in granules to allow slow absorption.

CEPHAELINE.

In 1894 Paul and Cownley succeeded in separating emetine (total alkaloid from ipecac) into two components—Cephaeline, and an alkaloid for which they retained the name "Emetine." The formula C_{15} H_{22} NO_2 has been assigned to the cephaeline, and C_{14} H_{20} NO_3 to the emetine of these investigators.

R. B. Wild (*Pharm. Jour.*, 1895, p 435) has made careful pharmacologic experiments with cephaeline. He finds that 5 milligrams (1-12 grain) produce nausea, slight dizziness, salivation, and retching but not actual vomiting; at the same time the arterial pressure is somewhat diminished. A dose of 10 milligrams (1-6 grain) produces similar effects, followed in an hour by violent vomiting; occasionally intestinal peristalsis is increased, a soft stool resulting. No appreciable influence on the nasal mucosa, skin or urinary system has been observed, and the vomited matter does not contain an excess of bile. Furthermore, cephaeline is reported to have but a moderately toxic action on the voluntary muscles; the walls of the blood-vessels are not excessively contracted, and the nervous supply of the heart is also not affected in an unusual degree."

The cost of cephaline precludes its employment, as emetine in large doses appears to cover its uses. Granules of gr. 1-134 each would cost about 1 cent apiece.

CERIUM OXALATE.

Standard granule—Gr. 1-6, gm. .01.

Cerium oxalate was introduced by Sir James Y. Simpson, as a remedy for the vomiting of pregnancy. It is white, odorless and tasteless; insoluble in water or in alcohol. Large doses cause dryness of the mouth. Cushny says it depresses the heart, causes vomiting and purging, with hyperemia and ecchymoses of the stomach and bowels, nephritis and congestion of the kidneys, when administered intravenously. Shoemaker pronounces it a sedative to the gastric mucosa.

This salt has held a precarious place as a remedy for the vomiting of pregnancy, opinions varying as to its efficacy. Those who look on this ailment as a disease to be treated *per se*, will not suc-

ceed with it. But when the bowels have been regulated, the fun tion of the kidneys brought up to the full measure of efficacy, ar rhagades and other affections of the uterus properly treated, tl oxalate of cerium will prove the best of the direct gastric sedativ

But if inflammatory or other irritations of the stomach are t cause of the vomiting it is doubtful if this remedy will give reli Hare speaks of it as a remedy for acidity. Shoemaker says it l been given for vomiting of uterine disease, and even of gast cancer; as well as for the obstinate vomiting of typhoid fever a that of phthisis. The nausea attending the administration of opia has been relieved by cerium. Image, who recommended it higl in uterine vomiting, says failure is due to the use of too small dos He gave gr. x, repeated every hour.

Clarke and Morje found cerium serviceable in whooping-cou lessening the severity and the frequency of the paroxysms. Sh maker speaks of its value in the severe cough of phthisis, or chronic bronchitis. It has also been used with benefit for dyspnea due to deficient innervation of the stomach, and in chro diarrhea. Less certain is its use in chorea, epilepsy and dysmen rhea.

Simpson gave the nitrate for irritative dyspepsia with gast dynia and pyrosis.

The fact seems to be that the oxalate of cerium is a direct se tive to the stomach mucosa, not suited to cases of acute inflamn tion or irritation. This irritability may be due to autotoxemia, deficient renal elimination, or to cerebral irritability. In which these is cerium indicated? It has seemed to exert a direct sedat effect on the gastric terminals of the vagus. More accurate obser tions should be had to determine why this remedy which acts brilliantly is some cases fails in others apparently similar.

Image recommended that the first dose—of gr. v—should taken before rising, and found three doses a day usually sufficie This is best for vomiting of pregnancy, and for gastralgia. acidity and other forms of recurrent vomiting, a smaller dose, 1-6 to j, repeated every five to fifteen minutes gives better resu Wood, who is a megalodoser, gives five grains every hour.

CETRARIN.

From Iceland moss is derived cetrarin, or cetraric acid, C_{18} H O_8, an intensely bitter principle forming hairlike needles. The m

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is treated with petrol-ether, precipitated with potassium carbonate and purified with hydrochloric acid. Cetrarin is insoluble in water, slightly in ether or cold alcohol, readily in boiling alcohol, in alkalies and their carbonates.

Merck terms cetrarin a hematinic, stomachic and expectorant, useful in chlorosis, where it increases the number of red-blood cells; also in incipient phthisis, bronchitis, and digestive disturbances with anemia.

Dose, 0.1 to 2.0.

Kobert states that cetraric acid increases intestinal peristalsis, and augments the number of both red and white blood-cells, especially when they have been diminished by disease. It slightly stimulates the central nervous system, and increases the secretion of saliva, bile and pancreatic fluid.

In Iceland the moss is employed as a prophylactic against elephantiasis. Eckfeldt recommended cetraric acid as a remedy for hemoptysis, and it has also been applied locally for epistaxis and for spongy gums.

As Merck lists cetrarin at 75 cents a gram, it is obviously beyond the reach of ordinary patients. Nor does it seem to be necessary to employ this principle, as probably all the benefit it affords will accrue from the use of Iceland moss as a food. This can be prepared as a jelly, flavored to suit the taste, with sugar, salt, or lemon; or as a beverage. But it is important to know that this rarely used food contains such valuable remedial properties.

In pernicious and intractable forms of anemia the cost may be disregarded, and this substance may prove most valuable at a period when other remedies fail.

CHELIDONIN.

Chelidonium majus, the greater celandine, is one of those plants that is continually being brought forward as a remedy, insufficiently tested, and allowed to drop back into obscurity. In this case it is as a remedy for cancer that it is advocated.

Closely related to the poppy, chelidonium rivals that storehouse of remedial agents in the number of active principles it contains. Schmidt announced that in celandine he found no less than 12 bases. Among these were chelerythrine, chelidonine, chelidoxanthine, and protopine. Concerning the properties of these principles our information is scanty and uncertain. Chelerythrine is said to be

identical with sanguinarine, which it closely resembles in physical properties. But this identity has been denied. Such assertions should always be taken with distrust. Identity of ultimate or of elementary composition is not necessarily identity of effect. Even in the case of theine, which Merck asserts to be identical with caffeine, so good an observer as Mays finds a decided difference in their therapeutic effects. Scopolamine is asserted to be identical with hyoscine, and this also is denied.

Merck gives the following data as to chelerythrine: Soluble in alcohol, ether, chloroform, benzine and petroleum oils; a cardiac poison. Sanguinarine is soluble in chloroform, amylic alcohol, benzine, alcohol and ether; stimulant, tonic, expectorant, purgative, emetic; dose gr. 1-12 to 1-4. Poison! The nitrate is soluble in water and in alcohol. Chelidonine is an alkaloid, white, crystalline, soluble in alcohol, chloroform, very slightly in ether, insoluble in water; non-toxic; narcotic, resembling morphine but less stimulating, slightly stimulating the spinal cord.

Therapeutics.—Ribbing and Ruempf used chelidonin in gastric ulcer, cancer and enteralgia, in doses of 2 to 5 centigrams. The results were quite satisfactory, in some cases even excellent. One advantage over opiates is that chelidonin produced no trace of heaviness, somnolence, constipation or other concomitant phenomena. Especially in infantile practice chelidonin was accorded preference over opium for its innocuity. With adults the dose of chelidonin is 0.10 to 2.0 or more.

It possesses calmative and hypnotic properties, while being less narcotic than the other alkaloids obtained from plants of the same family, such as the opium derivatives. It is precisely this small degree of toxicity that indicates the use of chelidonin in certain painful affections of the stomach and bowels.

Robinson made injections of chelidonin in a woman presenting a malignant tumor of the superior maxilla with large intrabuccal ulceration. Three hours after the injection reaction followed, intense, with shivering, but next day the tumor began to soften. The dose was increased and the tumor bathed twice daily with ext. chelidonium with an equal part of glycerin. The tumor has continued to decrease and is no longer inflamed. He deduces a specific action of chelidonin on malignant tumors.

Ivanow cites the case of a woman aged 53, with gastric cancer, treated by chelidonin internally. Her condition was one of profound marasmus with violent pains in the stomach, vomiting all food

so persistently that rectal feeding was necessitated. The vomitus had the appearance of coffee grounds; the liver was enlarged, the left lobe prominent. The existence of a malignant neoplasm was beyond doubt. Under the influence of chelidonin she improved rapidly, the vomiting that had persisted for three months ceased in fifteen days, the tenderness of the tumefaction as well as the gastric dilatation subsided and the appetite returned. Soon she could feed herself by the mouth and get up; she suffered no longer and returned to her occupation.

A lively reaction followed the administration of this medicament. The observed phenomena, local and general, have a characteristic clinical significance. The reaction had a certain general resemblance to that provoked by tuberculin. There was a sense of weakness, shivering, a little fever, 38 to 39 C., the progressive disappearance of the earthy tint of the skin, softening and subsidence of the tumor. The pains are gone, the general state good, lassitude disappeared, sleep restored, the aspect of the neoplasm improved, the patient feels herself much relieved and the inflammation retrogrades from day to day.

Observations of Denissenko, Ivanow, Kraisky and Meyer indicate the employment of chelidonin in gastric cancer, cancroids of the lids and lips, epitheliomas, malign neoplasms and all malignant tumors external and internal.

In gastric ulcer and cancer, enteralgias, cancer of the bowels or larynx and in hepatic tumors, the results of the treatment have been very favorable and rapid, the tumor continuing to diminish, the inflammation arrested, amelioration has been manifest and the cure often appears definitive.

In laryngeal cancer chelidonin has given very encouraging results, when employed locally by lotions and internally. Under its influence the pains of deglutition and the respiratory difficulty vanish and the general condition is promptly and considerably ameliorated.

Chelidonin may be given in very large doses without harm. Houdé advises 0.002 (gr. 1-30) six to eight times a day or twelve times in old cancerous diatheses. It is well tolerated. In gastralgia, enteralgia, etc., when only the calmant and hypnotic effect is desired, the doses need not be so large. For lotions and hypodermic injections he advises 1-1000 solutions.

CHIMAPHILIN.

Standard granule—Gr. 1-6, gm. .01.

Chimaphilin is a concentration from the leaves of Chimaphila umbellata, pipsissewa, prince's pine, ground holly, or wintergreen. The active principles are arbutin, chimaphilin and several others not yet studied. The remedial virtues accredited to this plant are those of arbutin. It has also a volatile ingredient, as the infusion is said to possess a value that is lost in the decoction.

Felter and Lloyd credit pipsissewa with diuretic, tonic, alterative and astringent properties. It increases waste and affects nutrition. It is used in scrofula and in chronic rheumatic and genitourinary affections. It relieves irritation of any part of the genitourinary tract, and improves the nutrition of the affected tissues. Its special field is in genital discharges with debility or scrofula. Cystitis with offensive urine, and urine loaded with mucus, muco-pus or blood, are benefited. Chronic pyelitis is also favorably influenced by pipsissewa, as well as chronic prostatitis, scrofulous ulcers, ascites, strangury, gleet, lithemia, etc.

Specific Indications.—Atony of the genitourinary organs, with lingering disorders, scanty urine, profuse mucus, pus or blood in urine, dysuria with smarting or burning pain, chronic irritation of urethra or prostate, relaxation of bladder walls, chronic prostatitis with vesical catarrh,

Ellingwood says chimaphila aids in restoring the excretory functions to a normal condition and removes irritation of the urinary tract, lesions of the skin and lymphatic glands, and removes waste matter from the blood, the result of defective metabolism. He finds its field in uricacidemia, dropsy with debility and anorexia, inflamed cervical, mesenteric or parotid glands, dropsy after exanthemata, chronic rheumatism, hectic with nightsweats, secondary syphilis, hematuria, gravel, gout, nephritis, the late stages of typhoid fever with deficient excretion, and mammary tumors supposed to be cancerous. For acute rheumatism he advises a warm infusion to be given till it causes perspiration, and the same applied to the affected joints.

Any virtues not due to the volatile ingredient may be much more easily obtained by the use of arbutin. Like it, pipsissewa blackens the urine.

The dose of chimaphilin is a grain before meals and at bedtime.

CHIONANTHIN.

Standard granule—Gr. 1-67.

Chionanthin is derived from the bark of the root of Chinonanthus Virginica (fringe-tree). The shrub is a native of the southeastern states and its medicinal qualities have been recognized popularly for a long time.

The eclectics regard this remedy with favor and it is unquestionably a most valuable hepatic stimulant and alterative. Chionanthin is aperient, diuretic, febrifuge, cholagog and purgative. Its tonic and alterative action is also marked if dosage is continued. In fact, it is as a continued remedy for chronic engorgements and sluggish liver that it has most value. In full doses (2 to 5 grains) it has a pronounced cholagog action and may be given in extreme conditions with podophyllin. But its main utility is as an alterative hepatic in jaundice, bilious conditions and catarrhal states of the bile-ducts. Then it should be given in doses of from gr. 1-6 to gr. 1-2, preferably after meals, three times daily. In a few days the skin clears, the patient feels brighter and his appetite returns. It seems to have a specific action in overcoming catarrh of the ducts, promotes the flow of bile and prevents the formation of calculi.

In any acute congestion of the liver this is the remedy of choice and should be given in full doses followed by sodium phosphate or other saline laxative. The jaundice of childhood rapidly yields to this remedy as does that of pregnancy. In all malarial conditions it is to be thought of and may be given during either the chill or fever with equally beneficial results. The author has found it in doses of gr. ⅓ three times daily unequalled for restoring to healthy activity the livers of sedentary workers. It may be combined with iridin, euonymin, leptandrin or podophyllin. It is a remedy which should be more used than it is.

CICUTINE.

Standard granule—Gr. 1-134, gm. .0005: cicutine hydrobromate, gr. 1-67, gm. .001.

The use of conium, celebrated in antiquity, has fallen into oblivion in most countries, on account of the uncertainty and general worthlessness of its galenic preparations. Dragendorff found in the leaves and fresh bark 0.0466 to 0.094 per cent of cicutine; in dried leaves 0.26 per cent, and in seeds gathered before maturity 0.766

per cent. Holmes found no toxic properties in the Scotch hemlock. Close could isolate only 0.0003 per cent of active principle from the ordinary dried leaves of the pharmacy. Von Schroff observed no toxic results from doses of 30 to 60 grains of the extract given to rabbits. At Dixmont we used the extract as a pill excipient in 1872. Such observations suffice to condemn the remedy as far as concerns the galenic preparations and the crude plant.

Cicutine is a liquid, lighter than water, readily decomposing in air, and volatile. It is more soluble in cold than in hot water; and is quite soluble in alcohol, ether, chloroform, acetone, benzole and the essential oils. The alkaline reaction is strong, even replacing ammonia. The salts of cicutine are quite permanent and free from objection, and these are preferable. The hydrobromate is in the form of small colorless rhombic prisms, resisting the air, soluble in water, containing 60.7 per cent of cicutine. It may be used subcutaneously, while cicutine is irritant.

Physiologic and Toxic Actions.—To the mucosa cicutine is irritant, but solutions applied to the skin produce anesthesia. In ancient times the hierophant presiding over the Eleusinian mysteries is said to have applied conium to the genitals of initiates to render easier the fulfillment of vows of chastity. In the eye the first irritation is great and the subsequent anesthesia correspondingly profound.

Cicutine is eliminated by the urine, the lungs, and in part broken up in the body.

The predominant action of cicutine is paralysant, at first of the terminal extremities, then of the trunks, of the motor nerves. At first limited to the voluntary muscles, it extends to those of respiration, the left heart, next to the diaphragm, and finally causes death by asphyxia, the preceding dyspnea accompanied by clonic spasms. The heart-action remains long unaffected if deoxidation is prevented by forced respiration. Consciousness remains unaffected to the last. There is probably a special action on the spinal centers, since reflex action is lost before the irritability of the peripheral nerves ceases.

One-fourth of a drop of cicutine taken in the mouth of a healthy man causes a sense of burning to the tongue, slight constriction of the throat, flow of saliva, nausea and vomiting, general malaise and heat of the head. A drop produces alarming symptoms, such as vertigo, impossibility of fixing the thoughts or the attention, somnolence, malaise very marked, ocular troubles, dilated pupils, alterations of touch and hearing, tremors, weakness, gait uncertain and

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vacillating, cyanosis, cold sweats, finally spasmodic muscular contractions when the muscles are forced to move. The pulse is small and weak, a slight primary rapidity being soon followed by slower pulsations.

Burggræve reports the following effects when taking cicutine: Tendency to repose and slumber, without fatigue, quite different from that of morphine; waking calm, without headache; softening of the pulse; notable diuresis and diaphoresis. It is evident how cicutine calms the pains of cancer and restores the forces by sleep.

Eulenberg mentions a sense of weakness and vertigo after a subcutaneous dose of gr. 1-67 but double this dose did no harm to the same patient.

In warm-blooded animals the effects of cicutine are manifested a minute or two after taking, by general paralysis, beginning sometimes with the anterior, sometimes with the posterior extremities; the respiration at first irregular is arrested, the heart continuing to beat for hours. If the dose is not fatal the animal recovers within twenty-four hours. Ligation of the iliac artery prevents paralysis of that limb. The only convulsions occurring are the clonic ones with asphyxia. Fibrillary muscular contractions from the first are probably due to a primary excitation preceding the peripheric motor paralysis. During the paralytic period the sensorium and sensation are unaffected.

Cicutine exerts its effects on the nervous centers, since ligation of all the vessels of the extremities does not prevent the diminution of reflex sensibility. The psychomotor centers appear, however, to be only affected secondarily, and from the deprivation of oxygen or the alteration of intravascular pressure. The lachrymal, salivary and renal secretions are increased by cicutine, but Prevost denies the direct influence on the sensory and secretory nerves. Jolyet and Pelissard have demonstrated the paralyzant action of cicutine on the pneumogastric nerve-ends, showing very quickly and after doses too light to paralyze the motor nerve-ends.

The intravascular pressure and the animal heat are increased, even after medicinal doses. The respiratory movement in grave poisoning is at first accelerated and convulsive, then retarded. The respiratory mechanism is not disturbed by light doses, which cause only irregular and paretic rhythm. Mydriasis is a pretty constant sign; rarely the opposite effect is seen.

Intestinal peristalsis persists even after death.

Ihmsen reported changes in the blood, but this is denied by Huesemann.

Binz reports an interesting case of poisoning with half an ounce of the fluid extract of conium, in a young woman of feeble constitution. Twenty minutes later she was seized with nausea and vertigo; she let fall what she was holding, and could not walk. She was put to bed. The pulse rose to 120 but was soon calmed. She was calm but could not execute the least motion of her arms or legs. An hour later the paralysis had extended to nearly all the muscles. The eyes were closed, the pupils dilated, the brain perfectly clear, calm but active. Asked to open her eyes, she could not move the lids. Pulse and respiration normal, heat of the skin natural. After an hour she could open her eyes, and in three hours motion was reëstablished. Next day there were only slight pains in the muscles of the legs. Here the heart and brain remained unaffected; but if still larger doses were taken paralysis of the diaphragm would follow, with cyanosis and its effect on heart and brain.

Imbert-Gourbeyre spoke of delirium and convulsions from hemlock, but he probably used impure preparations.

Since Ladenburg in 1886 produced cicutine synthetically it has been re-tried with the chemically pure substance thus secured, and the foregoing account of its actions practically confirmed. Respiration was first accelerated, then retarded. The blood-pressure rises at first, then sinks to normal, and only after large doses does it fall below normal. Cicutine paralyzes the terminals of the inhibitory fibers of the pneumogastric without preliminary excitation. The cessation of breathing is not due to paralysis of the respiratory center but of the motor terminals in the respiratory muscles, especially those of the phrenic nerve.

Synergists.—Van Renterghem names morphine, atropine, hyoscyamine, lobelin, curarine, veratrine and aconitine, all which diminish or abolish muscular irritability, motor nerve conduction, and the excito-motor force of the spinal cord.

Antagonists.—Strychnine, brucine and picrotoxin figure. This is only relative, since strychnine increases the reflex irritability of the cord, while cicutine reduces the excito-motor force of the medulla.

Tannic acid and potassium iodide are chemical antidotes.

Therapeutics.—Van Renterghem says the Germans, who have no active preparation of conium, find it useless; the English, who possess an active agent in succus conii, find it of positive value.

In whooping-cough its favorable action is comparable to that of atropine. Applied locally it lessens exaggerated sensibility and extinguishes the pain of neuralgias and of various tumors, even of cancer.

Binz found cicutine indicated in the tetanus of strychnine, in blepharospasm, and in external neuralgias.

The sedative effect exerted by cicutine upon the spinal cord indicates the use of this agent in all cases characterized by tonic convulsions, contractions, tetaniform rigidity, as well as in whooping-cough, rabies, traumatic and spontaneous tetanus, and in poisoning by any of the strychnine group. Pereira states, however, that in spite of the cessation of the convulsions, death seems to be hastened by the cicutine. The antidotal value must be decided by clinical observations.

Cicutine is not only hypocinetic, but it is stupefying or anesthetic, and therefore useful in affections eminently dolorous. But it is in the hyperesthetic and spasmodic affections of the respiratory apparatus, which serves it as a way for elimination, that cicutine renders great services. But to avail ourselves of its volatility it must be given free, in alcoholic solution diluted.

Since Storck, hemlock has been employed empirically for ganglionic and visceral engorgements, and for cancer. The moderns have accorded the same powers to the alkaloid, but the real benefits are limited to relief from the pains and spasms. In scrofulous ophthalmia with excessive photophobia and palpebral spasm, Fronmueller and Mauthner applied it with success. In inoperable mammary cancer with axillary involvement, von Schroff reported the cure of very extensive carcinomatous ulcers and the arrest of the malady after the employment of conium for many consecutive weeks.

Dujardin-Beaumetz said that while resembling curare it differed in also sedating the pneumogastric, and caused anesthesia. He was led to use it in perturbations of this nerve, and of the nervo-motor system. With potassium bromide it should give good results in convulsions, especially the reflexes emanating from the vagus, convulsive cough, asthma, whooping-cough, hiccough, dysphagia, vomiting, spasmodic bronchitis and laryngitis.

Stewart and Corry cured with cicutine two cases of traumatic tetanus.

Welch and Harley cured choreics with it.

In the convulsions of infancy, in tic douloureux, it would not be

bad. As it accelerates the pulse (Casaubon), lessens arterial tension (Pelvet), perturbs the system and the hematic function (Casaubon), which gives the key to its resolving action, cicutine should exhibit these effects when pushed to sufficient dosage.

Huesemann places it as useful for muscular spasms of peripheric origin, angina pectoris (Erlenmeyer), the obstinate and fatiguing cough of phthisis (Nega). As an antidote for strychnine, picrotoxin and carbolic acid, cicutine has not succeeded. It is not as anodyne as morphine. In cardialgia it often fails, except when accompanying functional affections of the liver (Reil). Locally it relieves the pain of dental caries.

It answers marvellously for blepharospasm and photophobia; and Schultz recommends it in place of curare for localized spasms.

Van Praag thinks it contraindicated for cachectics and those threatened with paralyses. Reil advises to avoid large doses in neuralgias in chloroanemics, and finds it causes vertigo in the well nourished and plethoric, and those of irritable temperament. It has failed in tetanus and hydrophobia.

Cicutine is indicated with the mydriatics as an antispasmodic, for hyperesthetic and neurosic pains, irritations of the spinal cord, painful spasms of the sphincters. It calms the lancinating pains of cancer without exercising any control over their course. In spasmodic coughs it sedates while favoring secretion. It procures calm sleep, without heaviness on waking, a valuable power. As an antiaphrodisiac it is of value, combined with camphor monobromide. It also controls hysteria at the height of the paroxysm.

In cutaneous hyperesthesias, pruritus, angina pectoris, it has had good success. In tuberculous meningitis it lowers the fever and sedates the excited brain. In all maladies of infancy with hyperesthesia it may be employed with success.

The best preparation is the hydrobromate, the dose gr. 1-67, to be repeated as often as the conditions indicate, every ten to twenty minutes in acute or painful affections, or three granules every four hours in chronic forms of disease.

Subcutaneously the hydrobromate may be given in watery solution in doses to suit.

Locally, Van Renterghem recommends a solution of gr. 1-12 in 1¼ to 3¾ drams of weak alcohol, for application to the skin or mucosa in pain. For blepharospasm and scrofulous glands Mauthner advises gr. 1-12 in 1¼ drams of sweet almond oil. This serves as a collyrium. Or we can use a solution of gr. 1½ in 150 minims

of weak alcohol, or a suspension in mucilage. But cocaine has replaced cicutine here.

As a hypnotic cicutine may replace the bulky synthetics so energetically exploited of late. There is not one of them as easily given, or so certain to relieve the irritability that prevents sleep; while cicutine has an anodyne power that excels all of them; and while not equal to that of morphine it can be used in many cases where the latter is not needed, besides being free from the physical and moral objections accruing to the use of all opiate derivatives. When this use of cicutine is fully comprehended it will become one of the stand-bys of our practice.

In cancer a few doses of an inert or uncertain preparation have been given, and on the certain failure resulting the drug has been condemned as useless. Give it internally and apply it locally in full doses, and see what the ancient repute of hemlock is worth when administered with modern thoroughness. We cannot afford to lose anything that will assuage the atrocious pangs of cancer, or that has a possibility of a cure. The hydrobromate should also be injected into the substance of the tumor, in doses beginning with gr. 2-67 and rising to full toleration. The use of the alkaloids necessitates a restudy of applied therapeutics.

As a sedative to the motor nerves and of the reflex function of the spinal cord, cicutine has a definite indication. Many cases show spinal irritability and exaltation of the reflex excitability. The indication is to ascertain and remove the cause, such as autotoxemia; and this has attracted most attention; yet the power of cicutine is not to be despised. Ganglionic excess calls for it, from whatever cause. In many cases of mental perturbation cicutine has proved highly useful. Shaller has called attention to its value when the patient fears the coming of insanity, or actually shows evidences of mental aberration. Also in the nervous disturbances incident to the menopause, it has proved salutary. In fact, the whole group of so-called hysteric affections, is speedily controlled by cicutine. These generally show a state of morbid excitability, an exhaustion of neural force, and a consequent inability to withstand the numberless petty irritations of life without an explosion of temper or emotion. Here cicutine is more efficient than valerian, and pleasanter to administer. The two are synergistic, and may often be combined with advantage.

In true asthma cicutine is better than in the asthmatic attacks incident to chronic pulmonary or bronchial maladies, where the

sedative effects of the drug on the respiratory apparatus may not be advisable. Stimulants like strychnine or aspidospermine will then do better.

Cicutine has not been given sufficiently in motor spasms like chorea and epilepsy. Alone it may be insufficient, but it aids other remedies greatly, and should form part of the treatment. Muscular twitching with cerebral fullness sometimes prevents sleep, and here it is difficult to find so admirably suitable a remedy as cicutine.

Dysmenorrheas of the spasmodic variety, and when connected with pelvic inflammations, are well controlled by cicutine, alone or in combination.

The fact that cicutine partially controls the effects of strychnine in toxic doses, though neither prevents the fatal result from the other, well illustrates the parallel or coincident action of apparently antagonistic agents.

Now that a uniform and effective form of this remedy is available, we may expect to see its therapeutic applications multiplied in the near future. It is well worth further study and trial.

CINCHONIDINE.

The writer once undertook to demonstrate the chlorine test for quinine before his class. The "quinine" was placed in a test tube, chlorine water and ammonia added, and—no green color ensued! As long as quinine costs more than cinchonidine, much of the latter will be sold as true quinine.

Does it matter? The effects of cinchonidine, physiologic and therapeutic, are practically identical. The dose is about the same. Some stomachs find cinchonidine easier to bear than quinine. Possibly when the alkaloids that thus closely resemble each other are carefully studied, in the light of modern science, we may learn why it pleased the Creator to produce several of these bodies instead of one. Minute differences will be discovered rendering each more accurately suited to certain conditions than the others. But this has not yet been done. For the present we must refer the reader to the chapter on quinine.

Cinchonidine is very slightly soluble in water or in ether, more so in alcohol. The sulphate is soluble in 100 parts cold and 4 parts boiling water, 71 parts alcohol, easily in acidulated water. The hydrochlorate is soluble in about 40 parts cold water. The tannate

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is a white tasteless powder, and possibly forms the basis of the "quinine" chocolates in the market. It has been recommended in diarrheas in doses of five to fifteen grains for adults.

CINCHONINE.

The value of cinchonine lies in its insolubility. Requiring over 3,700 parts of water, cold or hot, to dissolve it, this salt has been repeatedly exploited under the name of "tasteless quinine." It is only after being held some time in the mouth that the bitterness is developed. For children it may be given mixed with powdered sugar, and chocolate or cinnamon, without difficulty. This slow solution also renders cinchonine less apt to irritate the stomach. There is practically no available solvent for cinchonine, as it requires 371 parts of ether, or 400 of chloroform. The best solvent is a mixture of chloroform and alcohol. Even the sulphate requires 70 parts of cold water, 14 parts of boiling water, 6 parts of alcohol or 60 of chloroform. It is insoluble in ether, but readily soluble in acidulated water.

The iodosulphate of cinchonine is known as Antiseptol. It is a powder used instead of iodoform, and contains 50 per cent of iodine.

The therapeutic uses of cinchonine are those of quinine.

COCAINE.

Standard granules—Gr. 1-134, 1-67, 1-12; gm. .001, .0005, 005.

The leaves of the coca plant have long been used in South America as a means of enabling the user to withstand fatigue and the lack of food. The leaves are made into a masticatory. It is said that incredible journeys are made by the Peruvian Indians while chewing these leaves. When the Spaniards conquered Peru they found the Incas regarding the coca plant as sacred, and immediately proscribed it, inflicting the death penalty on any native on whose premises it was found growing. For centuries coca attracted no attention, though Isaac Ott, who investigated it a number of years ago predicted that it would one day fill a great place in therapeutics. But it was not till Koller discovered the anesthetic action of cocaine that the medical world awoke to a realization of the value of this drug. The keen commercial instincts of the nostrum venders aided in the exploitation of coca, and a whole noxious brood of wines and other preparations appeared. Since that time the use of cocaine as a

habit drug has become so extensive that some states have been compelled to legislate against it, and to regulate its sale more closely than the deadliest poisons.

In fact, when one realizes the harm done by this agent it seems as if there were wisdom in the Spanish regulations. In Peru inveterate consumers of coca are known as coqueros, and are recognizable by their unsteady gait, lax yellowish gray skin, lack-luster eyes surrounded with brown rings, tremulous lips, incoherent speech, stupid and apathetic condition. They are suspicious, hesitating, false and cunning. The signs of old age appear before midlife, and if they survive, imbecility results.

Physiologic and Toxic Actions.—Prolonged use of moderate doses of coca causes diminished salivary secretion, and sensation in the mouth, œsophagus and stomach; weakness in the legs, dilated pupils, irregular pulse and respiration, higher temperature, a dreamy state of the mind, disturbed sleep, aphonia, unsteady gait, pleasant or frightful hallucinations, and delirium. These are especially evident after a coca debauch. Exhaustion and depression do not follow such a spree.

The whole central nervous system is affected by cocaine, which acts directly on the nerve cells without affecting the circulation. The increase of reflex excitability, the superactivity of the circulatory and muscular systems, are evidences of the excitation of the centers at the base of the brain. Generally the stimulation of cocaine is followed like that of caffeine by a return complete and without transitional states to the normal state. Enormous doses cause an intervening stage of weakness and paralysis. Toxic doses are required by the mouth to dilate the pupils though small ones applied locally accomplish this readily.

Von Schroff says that after an initial acceleration of the respiration there is slowing. The pulse is hastened by medium doses, retarded by maximal doses. The cardiac fibers of the pneumogastric lose their excitability after small doses and are paralyzed by medium doses. The rapid pulse is therefore as with atropine due to paralysis of the inhibitory nerve. Medium doses increase vascular tension, large doses lessen it rapidly. The surface heat is augmented, while the central heat falls half to one degree Cent. From the moment the subject enters the convulsive stage the anal temperature rises above normal.

Rossbach says the striated muscles are unaffected. Intestinal peristalsis after a momentary increase with ischemia of the intestinal

walls is quickly followed by a notable diminution of motion, dilatation and venous congestion. Mucous secretion and saliva are lessened.

No constant effect on the renal functions has been determined.

In fatal poisoning, death is due to respiratory paralysis. The heart continues to beat after death for some time.

Von Anrep made some experiments to determine how far coca replaced food, and found that death by starvation occurred as quickly when coca was taken as without it. The runners who go long distances without food under its influence make up for it by gorging afterwards. But the weight of opinion favors the view that cocaine aids nutritional movements.

Espinosa saw under the influence of coca a notable increase in the excretion of urea and uric acid, as well as of phosphoric acid, and an increased exhalation by the lungs of carbonic acid. Of two rats starved by Moreno y Mais, the one that was given coca died in five days, having lost one-half more weight than the other which took no coca, and this rat survived. Demarle also concluded that emaciation was not prevented by coca, which therefore cannot be assimilated with caffeine and arsenic. These moderate the nutritional movement while cocaine accelerates it.

As with most plant remedies, cocaine does not exactly represent the effects of coca, and it is evident that there are other active agents in the leaves, in variable amounts and proportions. The yield of cocaine varies from 0.8 per cent down to 0.2 per cent; the other alkaloids being more plentiful when the cocaine is less. The extraction is difficult. Cocaine is made synthetically, the product being identical therapeutically with that from the leaves.

Liebreich says that cocaine acts on all the nervous centers beginning with the cerebrum and ending with spinal cord. The stimulant effect is far more prominent from small doses. It is not a nerve poison but only "surfeits the cells with food." The greater the brain and the higher the temperature, the smaller the dose that will cause convulsions. It increases the quantity of air in the lungs by first increasing and then decreasing the rate of breathing. This indicates that in fever there may be seen more effect from cocaine than in health.

Small doses do not affect the lumen of the blood-vessels; medium doses cause strong contraction, and large doses dilation from activity of the vasomotors. Applied to mucous membranes, cocaine solutions cause contraction of the blood-vessels with cylindrical

epithelium sooner than with the tesselated variety; and sooner with children than with adults. The cerebral vessels are rarely altered. The heart-action is uninfluenced by small doses, accelerated and even strengthened by medium doses and slowed by large ones. Cocaine cannot completely stop the heart.

There is a rise also in the venous pressure after medium doses of cocaine, and a fall after large ones. Small doses increase the working power of the muscles, more in those that have been at rest than in those that are already fatigued. When cocaine is taken during long marches the muscles recuperate very quickly on rest. But intermuscular injections diminish the force.

When administered by the stomach cocaine can manifest its effects in 20 minutes; by the subcutaneous method in 10 minutes. It appears first in the urine. It is eliminated by the mucous membranes also. When convulsions and dyspnea appear albumin and sugar may be found in the urine. The urine is increased (we are quoting Liebreich), but mucous secretions lessened.

The use of cocaine as a local anesthetic dates from Koller's publication in 1884. The remedy must come in contact with the tissue to be anesthetized, when all varieties of sensation are dulled. Or it may be applied to the trunk of a nerve. On the unabraded skin it has no influence unless driven in by cataphoresis. The motor nerves are affected as well as those of general and special sense. The tip of the tongue cannot be anesthetized by the strongest solutions. Applied to the eye it contracts the vessels, causing a slight sense of burning, followed by dryness, coldness and pallor. The lids open wider, the pupils dilate, there is anesthesia and analgesia of the cornea and conjunctiva, but not of the iris.

These phenomena appear in one to three minutes and last five to fifteen. Intraocular pressure is first slightly increased and then lessened. Accommodation is slightly limited, but never paralyzed. Exophthalmia may be simulated. Mydriasis comes in ten to twenty minutes and lasts some hours, or a day. The dilation can always be increased by atropine. Solutions of one to two per cent are strong enough for the eye.

Cushny attributes the rapid pulse to stimulation of the accelerator mechanism rather than to sedation of the inhibitory apparatus. If so, cocaine is not a direct antagonist of aconitine. Constriction is due to direct stimulation of the vasoconstrictor centers for section of the splanchnics relaxes the vascular tension. Total anuria for hours sometimes follows the use of cocaine, so that it seems likely that the

effect on the kidneys is due to the action on the bloodvessels. Cocaine may be termed a general protoplasmic poison.

Van Renterghem thus describes the results of his experiments in testing cocaine on his own person: Between noon and 4 p. m. he took ten doses of Merck's pure cocaine, each of ten centigrams, about 1.5 grains. The drug was allowed to dissolve in the mouth that the local effect could be studied at the same time. During the four hours he thus took 870 milligrams of cocaine, or about 14 grains. After the second half-hourly dose he felt no longer the slight tendency to sleep which had ensued after a bad night. After the third dose an agreeable sensation, like that of slight alcoholism. Cerebral activity ensued, he worked with pleasure, thoughts followed each other quickly, the judgment was more prompt. The humor was gay; he felt benevolence for all the world. This state was maintained throughout the experiment. After the seventh dose he perceived an agreeable warmth, the face was red, the pulse accelerated, the respiration normal. He felt the desire to talk, without cessation, and to be in movement. He felt the capacity to lift great weights. These symptoms lasted three hours after the last dose, then slowly subsided, so that by 11 p. m. everything had returned to the normal state. At noon the pulse was 74, temp. 37.4 C. in the armpit; when the last dose was taken, pulse 110 to 120, temp. 37.4 in the anus, 37.9 under the arm; at 11, when retiring, temp. under the arm 37.4, pulse 76. During the evening, which was passed at the theater, he felt no exhaustion, no fatigue. Dining at 4:30 he felt no hunger but ate mechanically as was his custom. The loss of taste may have explained this. He would have been as well satisfied to miss the meal. Digestion was good. No effect on the stools or the urine. Retired at 11:30, after a light repast, and passed a good night. At the moment of retiring he felt head a little contracted, slight indication of aching in the forehead, above the eyes, and at the vertex. Next morning this lasted till noon.

Experimenting upon himself Von Schroff found small doses increased the activity of the brain, while large ones, after a brief period of excitation, depressed the activity of the brain and caused somnolence. Fronmueller observed vertigo, delirium, ringing of the ears, and slumber. Plass felt vertigo and a sense of feebleness.

The vast majority of persons addicted to the cocaine habit acquire that accomplishment through the use of nostrums containing that drug, especially when used for hay fever and catarrh. Many morphine habitues add the use of cocaine which enables them to use

more morphine and prolong the waking period, that of euphoria. Physicians in busy practice also acquire the habit to enable them to work beyond their natural strength. In the South it is said that the negroes are becoming addicted to this dangerous drug; and it seems possible that the frightful crimes for which lynching is applied are due to cocaine.

The cocainist uses the drug almost constantly, injecting or snuffing a few drops of solution every few minutes. He is restless, constantly on the move, facile, an easy talker, good companion, tells good stories but tends to ramble on disconnectedly. He sits up all hours of the night, writing endlessly, the product of the night's labor being found scattered over the floor in the morning. Ask why he uses cocaine and he cannot tell. The most remarkable symptom is the utter lack of the moral principle. Obligations sacred to even the most abandoned have no importance to him. He is cunning, devises most plausible schemes to obtain cocaine. Once succeeding, he makes no effort to keep up the deception, regarding it as a joke, and depending on his wits to devise another scheme when a new supply is needed. Later he suffers with hallucinations, gets to picking "cocaine bugs" from his skin, thinks he is pursued by mobs for wholesale murders he has committed, etc. He rarely stops with cocaine but seeks to add all other habit-drugs of which he learns the use. Thus one man used morphine, cocaine, absinthe, whisky, menthol, chloroform, cannabis Indica, and hyoscine.

After a pretty large experience with various drug habits, the writer is skeptical as to the curability of the cocaine habit when once fully formed. Nothing is needed except deprivation of the drug, no special suffering ensues from its discontinuance. But the patient is utterly untrustworthy, and will secure the drug unless confined as in an insane asylum. Such restraint for a year is the only means of cure; and in one such case, after years' freedom the man went deliberately back to the drug and killed himself with it. Another, after six months in an asylum held himself straight for nearly two years, and one day killed himself with an overdose. One man after a year's abstinence, has remained free for five years and is to all indications cured, but whether this will prove permanent remains to be seen. It is almost the only exception in the writer's knowledge. And this applies to persons treated by every real expert and secret nostrum dispenser in the country. One man has been to 17 sanitaria for drug habits, and is now practically a life inmate. The difficulty is in the absence of the moral sense, and consequently of any real

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desire on the part of the habitue to be cured. In this there is a radical difference from the morphine victim, who in even the last stages revolts against his slavery and dies purposely if he cannot break his chains. The writer has never seen evidence of a restoration of the moral sense after it has once been extinguished by cocaine.

Another characteristic of the cocainist which should have been mentioned is his insensibility to pain on the one hand and his exaggerated way of talking about it on the other. He will use the dirtiest ditch water for his solutions, half fill his syringe with the dirty mixture and inject dirt, air and all into a vein to get quick effect with the most absolute indifference to results. In fact, the writer has known men to do this to demonstrate the harmlessness of air in the veins. If abscess or ulcer results, so much the better, for this gives him an excuse for obtaining more cocaine! But inflict on him the most trifling suffering—even the prick of the hypodermic he has used hundreds of times, and he will complain for weeks of the "sufferings of the damned" caused by it.

Synergists.—Caffeine like cocaine excites the cerebral cells and the muscular system. Strychnine increases the excitability of the spinal cord. Cicutine and brucine, as well as yohimbine, cause local anesthesia and analgesia. Atropine paralyses the cardiac inhibitory nerves, and dilates the pupil. Aconitine also dilates the pupil, but in its general action is antagonized by cocaine even more exactly than by atropine.

Incompatibles.—Hydrochloric acid breaks cocaine up into ecgonine, alcohol and benzoic acid.

Therapeutics.—The local applications of cocaine are too well known to require enumeration. Solutions may be applied to the unbroken mucous membranes but the cutaneous epithelium bars its action. It is used subcutaneously along the lines of an operation, or injected at some part so as to come in contact with the trunk of the nerve at whose distribution anesthesia is desired. Injected into the spinal canal anesthesia of the entire lower extremity including the pelvic organs is secured. This has been utilized to secure painless parturition. One nice local application is in the removal of foreign bodies imbedded in the cornea. The cocaine not only anesthetizes the cornea but the contraction of the vessels often releases the foreign body and facilitates its removal. Cocaine is also applied locally to reduce reflex action and to relieve pain, such as neuralgia, where the salt is injected along the course of the affected nerve.

The hydrochlorate of cocaine is the salt used, and it is soluble in almost any proportion in water, alcohol, alkaline solutions, glycerin, oleic acid, etc. Solutions lose their value soon, and should be prepared freshly when needed.

Internally cocaine has been recommended as a means of tiding the morphine habitue over the withdrawal period. The writer has seen many such cases, and the invariable result of this medication has been that the suffering is simply postponed and recurs when the patient is less able to bear it; while the patient is too apt to add the cocaine habit to his preëxisting ones.

Wood recommends cocaine as a cardiac stimulant in pneumonia, alternating with strychnine, and claims that the effects of the latter are thus supplemented. But this author has apparently not tried the use of strychnine by cumulative dosage. There is nothing in the studies here recorded of the physiologic action of cocaine to indicate its use in this manner. Indeed, the well-known variability of this drug as to its effects on individuals renders it improper for use with those on whom it has not been tried. For while large doses may be well borne by one man, another may be injuriously affected by even half a milligram—gr. 1-134.

Special care must be taken in administering cocaine to alcoholics, who are apt to react unfavorably to it. But in threatened mania-a-potu a combination of cocaine with capsicin has proved the most effective treatment the writer has ever employed. Here gr. 1-12 to 1-18 of cocaine with the same dose of capsicin may be given every one to two hours. This has dissipated an impending delirium tremens that seemed unavoidable.

The untoward effects described are attributed by Liebreich to other active principles in the coca not separated from the cocaine in the process of extraction. The use of synthetic cocaine or of eucaine is not liable to this uncertainty. The writer has witnessed alarming heart failure, syncope, etc., continuing and recurring for hours, after cocaine used locally or internally. A sense of debility, malaise and anxiety are common. There may be excess or failure of any of the secretions or functions of the body. These symptoms may end in collapse.

The treatment of cocaine poisoning consists in the evacuation of the stomach if taken by that route, and the administration of stimulant doses of morphine—gr. ⅛—of ammonia, glonoin for syncope, and brucine to sustain quickly the heart and respiration.

Van Renterghem recommends cocaine internally for vomiting

due to gastric hyperesthesia and excited by the contact of food; and in gastralgia of ulcer.

Rabuteau recommended cocaine in diabetes mellitus and in albuminuria, believing that its action enhances the combustion of saccharine and albuminoid matters, which are thus utilized instead of being eliminated as a loss. He also advised it for phthisis, to increase the digestive powers. Under its influence he saw the appetite increase and the vomiting cease, even with subjects in the third stage. But as cocaine increases waste, the arsenates, or caffeine, with the hypophosphites, should be also administered to retard the movement of assimilation and disassimilation.

The action of cocaine is increased by adding strychnine and caffeine when given to enable one to bear unavoidable fatigue or prolonged exertions and exposure. But that this is a ready mode of establishing the cocaine habit scarcely needs to be said.

Manassein found cocaine effective in relieving the vomiting and collapse of cholera morbus. Shoemaker says it sometimes relieves migraine promptly. For vomiting of pregnancy and for seasickness it is often useful. The dysphagia of laryngeal tuberculosis may be relieved by cocainizing the affected parts before meals. Thorington found it useful in yellow fever.

Bartholow praised it in hiccough, asthma, chorea, paralysis agitans, senile tremor, and that of alcoholism. An Algerian physician reported that cocaine was markedly tolerated in smallpox and beneficial. Bauduy advised it in melancholia but others deny this.

Taken altogether, considering the remarkable properties of this alkaloid, surprisingly little is to be said as to its internal therapeutics. This is largely due to the danger of the habit, which renders it even more perilous than morphine, as the formation of the habit of cocaine is so much more insidious. There are thousands of cocainists who have not yet found it out. The writer has tried the use of coca in training boat crews for races and found the same crew did better without it. Whatever it does when the fresh leaves are chewed in Peru, no such effects as are described are obtainable from cocaine or from any of the preparations, officinal or proprietary, to be found in the shops. Possibly, as Rusby suggests, there is a volatile element in the fresh leaves that is lost in drying them.

The dose of cocaine internally for any sort of vomiting is gr. 1-67 every fifteen minutes till effect. As a cardiac stimulant in pneumonia gr. 1-6 may be given every eight hours with a dose of

strychnine alternated. Many of the effects attributed to coca, therapeutic as well as toxic, are undoubtedly suggestive.

Since brucine is a local anesthetic and a heart tonic as well, the writer has employed a five per cent solution of the hydrochlorate with cocaine added in two per cent, in those cases where the use of cocaine alone was followed by symptoms of syncope or collapse. This has proved successful in every case as yet tested with it.

CODEINE.

Standard granules—Gr. 1-67; gm. .001; gr. 1-6, gm. .01.

In 1832 codeine was discovered by Rebiquet. Chemically it is a methyl morphine. It is soluble in alcohol, ether, chloroform, benzole, petrolether, amylic alcohol and diluted acids, fairly soluble in water and slightly in ammonia. It is a strong base, and a number of salts are listed. The phosphate is especially soluble in water. Van Renterghem takes occasion to say: "Chemistry which has isolated the different principles of opium, and experimental physiology, have taught us their modes of action; so that it is quite natural for the clinician to reject this dangerous composition, this double-edged tool as Hufeland termed it, and use only the principal extractives, of which one can always measure the action."

Binz says: "In prescribing opium, the physician gives to the patient a complex substance which can produce inconvenient and uncontrollable effects since they depend on the richness of the medicament, always variable, in diverse active principles. In grave cases where he desires the narcotic action—that of morphine—he should avoid prescribing opium."

Water at 60 F., dissolves pure codeine 12.6 parts in 1,000; at 212 F. 58.8 parts. Crude opium yields about 0.6 per cent of codeine. Codeine has been prepared synthetically by heating an alcoholic solution of morphine with soda and methyl iodide.

Physiologic Action.—Van Renterghem one evening took 100 milligrams of codeine in divided doses. There resulted slight redness of the face, slight excitement of the nervous system, but sleep did not supervene till late. The sleep was light, troubled by dreams; on waking, pressure at the temples, disagreeable sensation in the head, and absence of appetite. Though the usual dose of saline was not taken there were liquid stools. At 1 p. m. next day, after a good walk in the open air, all signs of the intoxication had vanished.

The same observer has often taken at bedtime a single dose of

codeine, 10 milligrams, with sleep following shortly. This was profound, the waking without discomfort but a sense of well being and restfulness.

Rabuteau found doses of 150 milligrams produce in half an hour muscular fatigue, itching, worse in extremities, pupillary contraction, lasting more than a day; no sleep, scarcely the beginning of somnolence.

Bardet found no effect from doses under three grains, which caused heaviness of the head, muscular weakness, but no hypnosis. Six grains caused such weakness that walking was impossible; with pruritus often and twice erythema.

Huesemann found codeine in small doses hypnotic, but in large doses the effect approximated that of picrotoxin.

Van Renterghem resumes the evidence and concludes that codeine in small doses has an action calmant, lightly hypnotic, quieting the sense of hunger, neither constipating nor deranging digestion; in large doses it excites, causes agitation, headache, inappetence, nausea, vomiting and may lead to convulsions. Experiments on animals seem to show a more pronounced convulsant action than that of morphine. Liebreich found from codeine an increase of reflex excitability of the spinal cord, going with increased doses to tetanic convulsions, and death from asphyxia and general paralysis finally. He notes from large doses also a sense of heat, trembling of the muscles and slow pulse.

Cushny says codeine depresses the brain less than morphine and stimulates the cord and medulla more. The respiration is not so much slowed and may even be accelerated.

Tauber says codeine is mainly excreted by the kidneys.

Murrell says that codeine is merely a little morphine, acting similarly in larger doses; but this is not borne out by the foregoing account.

Therapeutics.—As a hypnotic and antispasmodic codeine does not replace morphine, but may be used where it does not agree. Cushny also prefers codeine for the insomnia of melancholia. When there is any tendency to cerebral hyperemia codeine is preferable to morphine. While either will induce a drug habit codeine is somewhat less liable to do so.

Brunton and Freund claim that codeine has a specific effect in relieving pains of the intestines and ovaries. It has also been advocated for blepharospasm, photophobia, sciatica, gastralgia, bulimia, hepatic and ovarian colics.

But it is in affections of the respiratory apparatus that codeine finds its chief use. It soothes the disposition to cough and promotes freer expectoration. Van Renterghem combines codeine with iodoform, to calm coughs, and soothe pain in the alimentary canal. In dry coughs he gives codeine with apomorphine, especially in late phthisis. With cicutine or helenine it is serviceable in spasmodic coughs. Given with veratrine it prevents irritation of the stomach in those who cannot take the latter alone. In gastralgia, enteralgia and pains about the neck of the bladder, codeine acts as an anodyne without interfering with the digestion or constipating. Here he associates hyoscyamine, atropine, cicutine and the vital incitant, strychnine. In infantile practice codeine replaces morphine generally as an anodyne and hypnotic; also in women, aged persons and those menaced with congestions of the brain (Gubler).

Trousseau also recommended codeine in acute bronchitis with hyperesthesia and spasm of the bronchi, and constant cough.

Vigla and Aran recommended codeine in bronchorrhea and intestinal relaxation, to lessen mucous hypersecretion.

Codeine has been extensively employed in the treatment of diabetes mellitus and insipidus. It lessens the excretion of urine and the output of sugar. The doses here have been raised to 15 grains a day, there being a special tolerance of the drug. It is doubtful if codeine possesses any special advantage here over morphine except for the absence of ill effects in the alimentary canal. Shoemaker says some cases are cured and many benefited by codeine. Van Renterghem speaks well of this agent in strangury, in chronic urinary affections. He recommends here codeine with atropine and cicutine.

Lochbuehler thinks codeine has a special control over serous inflammations. Brunton credits it with a specific influence over the sympathetic, and recommends it for the severe pains of perityphlitis, abdominal tumor, fecal impaction, cancer of the liver and pancreas, and appendicitis.

Dornblueth preferred codeine to hyoscine in sedating the insane, when the latter caused hallucinations, and if there were anxiety, precordial distress or insomnia.

Merck's codeine is about half the strength of morphine. The dose for an adult, single, at bedtime is gr. 1-6; for an infant from 1-134 to 1-67. Either may be repeated every half-hour if needed. The same care should be exercised as in administering morphine.

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COLCHICINE.

Standard granule—Gr. 1-134, gm. .0005.

Colchicine is the active principle of Colchicum autumnale, meadow saffron, and is found also in other species of colchicum. It is doubtful if colchicine ranks with the alkaloids, as a pyridine derivative, since it has an acid reaction. It is soluble in water, alcohol, ether and chloroform.

This drug has fallen into disuse from the uncertainty of its preparations. There are two wines, two tinctures and two fluid extracts, of the root and seed, each with a different dose. And yet nearly every writer on this drug selects one preparation, condemning the rest as worthless; and that selected is usually not officinal but a proprietary article, such as Allen's wine of the root. The writer has always been bewildered when he tried to prescribe colchicum and generally resorted to his books before doing so; and even then, he has never prescribed a galenic of colchicum with any certainty as to the effect to be expected. As the effect of any of these is simply due to the active principle contained, it is obvious that colchicum is preëminently one of the drugs whose crude forms should be retired from the shelves of the pharmacy.

Zeissl obtained colchicine by treating the seed with 90 per cent alcohol; the alcohol was then removed and the residue dissolved in distilled water, and shaken up with chloroform absolutely free from hydrochloric acid. When the chloroform is distilled off there remains a syrupy residue, which on strong cooling, deposits rosette crystal-groups. This is purified by adding small quantities of pure chloroform; the colchicine is taken up in a large quantity of the same solvent, condensed, mixed with ether, and from this crystallized. The result is a combination of colchicine with two molecules of chloroform, the formula being $C_{22}H_{25}NO_6 2CHCl_3$. On evaporation chloroform is given off, but not all even on prolonged heating. The crystals are luminous in the dark. When free from chloroform, colchicine is amorphous, bright yellow, darkening on exposure to light, with strong electric qualities when triturated. Zeissl's colchicine is lævogyrous. The addition of mineral acids, or boiling with alkalies, splits off a methoxyl group, leaving colchiceine, or aceto-trimethyl-colchicinic acid.

On heating colchicine with hydrochloric acid to 302 F., ammonia is split off. Colchicine gives no salt with acids, and is not precipitated with platinum chloride. Concentrated nitric acid dis-

solves it, giving first a violet, then a yellow color. Sulphuric acid containing nitric acid gives at first a yellow-green, passing over gradually to green, blue, wine-red, then again yellow, and on addition of concentrated caustic soda solution, it becomes red. Bromine water gives a yellowish precipitate, and potassium iodide a brown. Boiled in iron chloride it colors this acid solution green to dark green, and shaken up with chloroform this becomes brownish to red. Mercuric chloride produces in the hydrochloric solution a lemon-yellow precipitate, as do gold chloride, cadmium iodide, potassio-mercuric-iodide, potassium bismuth iodide (yellow to brown), phosphor-wolframic and phosphor-molybdenic acids. Potassium chromate and sulphuric acid give a dirty orange-yellow precipitate. Tannic acid gives a white precipitate. Picric acid gives no precipitate. Solution of phenol gives a milky coloring, which after some time condenses into resinous little drops.

Colchiceine gives salts with bases and acids, and with gold chloride a double salt. In the same way colchicinic acid, dimethyl and trimethyl colchicinic acids combine with acids and bases (Liebreich).

Physiologic Action.—Two to six hours elapse after its administration before effects are manifest. Given by the stomach or subcutaneously in toxic doses gastric and intestinal discomfort are felt, then gastric pain, salivation, nausea, vomiting and diarrhea. The dejecta become mucous and blood-streaked, the vomit becomes bloody, skin covered with cold sweat. Depression, apathy and collapse follow; motion becomes difficult, especially in the legs, the motor paralysis becoming complete and creeping up until it reaches the respiratory centers, causing death by asphyxia. Muscular pains may replace the spasms (Wood). Reflex action is depressed (Albers). Vertigo and anxiety are usual, and sometimes confusion or delirium precedes collapse, but usually the mind is clear till death. The largest doses finally paralyze vagus-inhibition (Brunton).

The pulse becomes small and rapid in collapse, but there is no direct action on the circulation.

Respiration is at first deep and full, becoming shallow, death being due to paralysis of this center. The heart beats after death. The bowel-action is hurried by increased irritability of the nervous mechanism (Jacobj); and the mucosa is also irritated (Cushny). The muscles are affected as by veratrine, becoming quickly fatigued. Locally applied colchicine is intensely irritant. Cushny attributes

the nervous symptoms to the collapse produced by the gastro-intestinal irritation, with no direct cerebral depression. So also the collapse is attended by a consequent sensory paralysis.

Small doses increase the urinary fluid, the urea and uric acid excreted, but larger ones lessen or stop the fluid secretions (Paton). Hematuria occurs in animals. The symptoms are attributed by Cushny to the excretion of the colchicine by the bowels and the kidneys, and consequent irritation of these structures. Excretion may be concentrated upon either. Brunton places colchicine among the most powerful hepatic stimulants; in large doses also stimulating intestinal secretion and peristalsis. He ranks it also as an alterative, improving nutrition in an unknown manner; and as a hydragogue diuretic. The effects are more marked on carnivora than on herbivora.

In man colchicum rarely causes more damage than a duodenal catarrh. In animals poisoned by this drug the postmortem shows evidences of acute gastro-enteritis, ecchymoses, free blood in the alimentary canal, the blood dark and coagulating with difficulty.

Brunton says that in continued non-toxic doses it causes anorexia, faucial irritation, flatulence, loaded tongue, uneasiness and pain in stomach and bowels; nausea and diarrhea, slow pulse and muscular debility.

Mairet and Combemale state that in doses of 0.0002 to 0.0003, colchicine causes in healthy men mild headache, muscular weakness, abdominal pains, rapid pulse, thirst and diuresis; in doses of 0.005, diarrhea and oliguria.

Van Renterghem took 0.0005 of colchicine, every half-hour for 20 doses. Slightly increased peristalsis alone occurred. An arthritic patient took the same dose every hour for five days, in which he took 0.035 in all, occasioning dyspeptic symptoms, not severe, subsiding on discontinuing the medicament. Colchicine administered hypodermically does not manifest its action for an hour. In slowness of getting to work it contrasts with the promptness of veratrine.

Veratrine, aconitine, emetine and digitalin are in certain conditions synergistic to colchicine. Morphine neutralizes some of the effects, but favors the absorption of colchicine by soothing mucous irritability.

Colchicine is contraindicated by gastric or intestinal irritability, and when its use is followed by over-action, by pains, colics, etc.

It should be contraindicated in phthisis, but observations on this point are wanting.

Most of the experiments made with colchicine are valueless, because the experimentors failed to observe sufficiently the variations of diet, by which the elimination of urea and uric acid would be influenced. Besides, under the name of colchicine a number of mixtures were employed, containing colchiceine, chloroform, and numerous by-products. Paschkis employed a pure colchicine, and his results, confirmed in the main by Rossbach, are therefore to be accorded more respect than others. Paschkis could detect no increase of blood-pressure from colchicine, but in cases showing abnormally high pressure the drug occasioned a diminution. Sensibility was also reduced.

The conflicting testimony in regard to colchicine may be summed up in the statement that small doses increase the excretion of urine, as far as relates to the water, the urea and the uric acid; while large medicinal doses cause vomiting and diarrhea, due to the excretion of the drug through the mucous membrane of the stomach and bowels. As colchicine acts far more vigorously on carnivora, it is probable that it is more effective in those who eat too much nitrogenous food. Does colchicine increase the internal secretion of the kidneys or of the other organs? It is not found in the bile; but Shaller states that bile is always present in the evacuations produced by colchicine, and as it relieves hepatic congestion it evidently increases the activity of the liver. But as hepatic torpor is often associated with uricacidemia, the relief may be secondary to the general benefit of the increased excretion. And yet as urea is a product of the liver, does colchicine increase the production or simply the excretion of the bile? These queries, unanswerable at present, show how superficial has been the study of even the most popular articles in our materia medica.

Shaller says that colchicine increases the secretions of the liver intestines, kidneys and skin.

Therapeutics.—In gout colchicine has won the reputation of a specific, and especially in the acuter manifestations of this affection. The usual method was to administer enough of the drug to produce decided action on the stomach or bowels; and with this the acute pain and other evidences of the attack subsided. Whether colchicum is effective against the chronic forms of gout is not so clear, since victims of this malady, if relieved of the pains, are apt to indulge in the pleasures of the table to a still greater extent. But

when the proper balance between the diet and the exercise is maintained, colchicine will prove of great assistance in eliminating from the body its excess of uric acid.

In America gout is represented by uricacidemia, and in the multifarious manifestations of this diathesis, colchicine is the first of remedies. It is not necessary to push the drug to the production of unpleasant effects. Let the granules be taken until slight looseness of the bowels is evident, and then suspend the medication until the next day. The daily dose thus ascertained, may be divided into three and taken before meals in the usual way.

Colchicine is more rapidly absorbed than the galenic preparations of colchicum, but the slowness of its action renders this agent ill fitted for rapid, cumulative administration; so that the doses should be at least two hours apart. So numerous are the manifestations of uricacidemia, myalgic pains, headaches, catarrhs acute and chronic, itching and other irritations of the skin, gastro-intestinal catarrhs with the numerous train of ailments pertaining thereto, that one cannot go far wrong in prescribing colchicine for a plethoric person, or a carnivorous individual, complaining of these or of any anomalous ailment. And in this land, where most persons eat meat twenty-one times a week, there is perhaps no agent more generally useful.

The great objection to colchicine is its remarkable efficiency. The melancholy, dullness, sluggishness, anorexia, bad breath, "tired feeling," are so promptly dissipated by a few granules of colchicine, that the patient, perhaps unconsciously, increases his consumption of meat and relaxes his exercise, relying on the daily dose of colchicine to keep him comfortable. It would be far better to forego the aid of all drugs, and let nature punish the slothful glutton until he is driven back to hygienic living.

Abbott reports excellent results in pleurisy occurring in rheumatics, from colchicine combined with aconitine and bryonin.

In gout, colchicine acts best with or following purgatives (Brunton).

In rheumatic gout, colchicine and iodides give some relief (Brunton).

Butler advises colchicine in full doses for ascites from hepatic obstruction, and mentions its use in gonorrhea, chordee, hypochondria with renal insufficiency, ocular inflammations, and local manifestations of gout. Abadie found colchicine, 0.001 two to four times daily, of value in scleritis. Woodbury injects it into the nerve-

sheath in sciatica, but Butler condemns this on account of the severe local irritation.

Treatment of colchicine poisoning: Empty the stomach and bowels if not already done, giving abundance of warm water. Tannic acid is the only known chemical antidote; it is not reliable but give it freely. Check vomiting and purging by morphine. Allay irritation by white of egg in water. Treat symptoms as they arise. External heat. Atropine. Stimulants.

Dosage: In acute gout and rheumatism, Shaller advises 0.0005 to 0.001, every hour, or oftener in robust cases, with aconitine, until the pain and fever are subdued, or the bowels thoroughly moved. After full action the doses should be reduced and the benzoates added. Delicate patients should take the drug less frequently. In chronic rheumatism with stiffness of the joints bryonin is a useful adjuvant. He reports two cases of obstinate sciatica cured by colchicine, 0.001 every two hours till free purgation, then 0.0005 every three hours. In rheumatic neuralgia, quinine arsenate 0.01, should be added to each dose.

Merck gives the dose of his colchicine as 0.005 to 0.0022, two or three times a day. I have rarely found it advisable to give more than 0.0005 four times a day, and this will be too much for persons with delicate stomachs. In acute gout or the cerebral congestions of plethoric persons, where a strong and speedy effect is required, give 0.001, dissolved in hot water and repeated in two hours. Gelsemin, veratrine or lobelin may be added in cases requiring speedy relaxation.

COLLINSONIN.

Standard granule—Gr. 1-6, gm. .01.

Collinsonin is a concentration from Collinsonia Canadensis, stone-root. The composition of this remedy has never been studied, except that Lochman found in it a volatile oil.

Therapeutics.—Felter and Lloyd consider it alterative, tonic, stimulant and diuretic, acting principally on the veins and mucosa, but sedating irritation of the vagus. Minute doses of the green plant cause prompt emesis. Poultices of the leaves have been applied for a great variety of affections, external and internal. It has been given for the whole line of uterine maladies, amenorrhea, dysmenorrhea, menorrhagia, vicarious menstruation, prolapsus uteri, leucorrhea, threatened abortion, and even pruritus vulvæ, dependent

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on varicosities. It is an old remedy for gravel, useful in cystitis, spermatorrhea and varicocele when accompanied by piles. All catarrhs are benefited by it, even the cough of phthisis. Ministers' sore throat is especially benefited by it; as is aphonia, chronic laryngitis, bronchitis, etc. In diseases of the gastrointestinal tract it relieves irritation, improves digestion, promotes the flow of gastric juice and gives tone to the weak tissues. Piles always increase the indication. The most marked symptoms calling for it are constriction, heat and weight in the rectum, dry scybalous feces, in pregnant women, and piles with rectal irritation but no constipation. In constipation collinsonin is useful from its tonic action on the rectal tissues.

Other conditions for which these authors recommend it are subacute proctitis, tenesmus of dysentery, dysenteric cholera infantum, rectal pain and inflammation after operations; irritation of anal fistulas, ulcers and pockets; neurotic rectal pains, hypogastric pains not vesical, all if associated with rectal capillary congestion; in atonic dyspepsia and chronic disease with feeble digestion it acts as a tonic and stimulant, and increases secretion from skin and kidneys, relieving nervous irritation and increasing innervation (Scudder).

In chronic pulmonary diseases it relieves irritation and stimulates expectoration; quiets pneumogastric irritation, that of heart disease and the asthma attending or simulating phthisis, and strengthens and regulates the circulation; is serviceable in hydropericardium, rheumatic heart-diseases and functional affections due to gastric irritation; mitral regurgitation and the cough of heart disease are greatly benefited by it; lack of tonicity of the blood-vessels is overcome—in short, passive vascular engorgement, with dilated capillaries, torpid portal circulation and lack of muscular tonicity, call for stone-root.

Foltz advises collinsonin for ear diseases with increase of secretion but not pus, and when follicular pharyngitis or hypertrophy of Luschka's gland is present.

Scudder gives as indications for collinsonin: A sense of constriction with irritation in throat, larynx or anus; or with tickling in throat, cough on talking; sense of foreign body in rectum with contraction of sphincter and contracted and painful perineum.

Ellingwood ranks collinsonia among the stomachics, and attributes to it a tonic influence over the heart muscle, the walls of the veins and dilated capillaries. He terms it a specific for hemorrhoids, which if recent can be cured in three days to a week by collinsonia.

He combines it with hamamelis, and gives before and after operation. Collinsonia is of value in the hemorrhoids of pregnancy; also for rectal pain from any cause; specific for pain in the lower bowel, persistent and steady. In bladder affections it is only useful when the walls are relaxed and distended. In bicycle heart it is useful, with cactus. In passive hemorrhages also he gives it with hamamelis.

Shoemaker recommends collinsonia as a useful local astringent; as a stomachic tonic in alcoholism, lessening the appetite for liquor; as an antispasmodic in croup and whooping-cough, chorea, anal sphincter spasm with hemorrhoids, etc.; some cases of dysmenorrhea, for which he advises this remedy for a week preceding and during the flow; in vaginal suppositories for vaginismus; renal and biliary colic; infantile and flatulent colics; in acute cystitis, with aconite and morphine, it is more rapidly efficacious than any other treatment. For incontinence of urine in children, and when in adults there is a dripping of a few drops of urine after urination is apparently concluded, collinsonia relieves effectually. It arrests the discharge of chronic gonorrhea when the customary remedies fail. It has also succeeded in curing leucorrhea and prostatorrhea.

From this we gather that collinsonin is an astringent, specially affecting the veins and capillaries as hamamelin does. But there is more than this in it—tannic and gallic acids do not give the effects detailed. The hint as to its use in the elderly bladder is important. It may aid in postponing catheter life somewhat.

The dose of collinsonin is gr. 1-6 to iv, every two hours. The galenic preparations are so variable that it is impossible to give an approximation to their dosage. Webster prefers a tincture of the green plant, but most writers use the infusion, or Lloyd's specific, of which the dose is gtt. 1-10 to 15.

COLOCYNTHIN.

Standard granule—Gr. 1-134, gm. .0005.

Colocynthin, a glucoside, is derived from the colocynth, and represents its remedial powers. The yield is about 0.6 per cent (Henke).

In small doses colocynthin is a sure and powerful cathartic, stimulating at once the intestinal peristalsis and the mucous secretion. The increase in the urinary secretion noted especially after large doses may be due to a local action, colocynthin being elim-

inated by the kidneys, or to derivation: The free, watery stools relieve the abdominal viscera of abnormal pressure, the renal veins are unloaded, and the movement of blood through the renal arteries allows a freer flow of urine (Van Renterghem). Hufeland counted colocynth among the most powerful of diuretics.

Sobernheim credits colocynthin with a predilection for the abdominal ganglionic system and the inferior medullary plexus. He thus explains its beneficial effects upon paralysis of the lower extremities, the rectum and bladder. This action is in part alterative, in part stimulant, and presents some analogy with that of the acrid narcotics. In fact, when we increase the doses of colocynthin we get symptoms of narcotic poisoning—heaviness of the head, vertigo, delirium, cloudy vision, deafness, etc.

Excessive doses cause small bloody stools, acute colic, tenesmus, nausea, vomiting, tension and excessive sensibility of the abdomen, complete suppression of the stools and urine, retraction of the testicles, priapism and death (Gubler).

On autopsy we find signs of gastroenteritis, and traces of inflammation of the liver, spleen and kidneys.

The action of colocynthin is chiefly manifested in the large intestine, the colon rather than the rectum. It stimulates the secretion of bile more than does jalap or croton oil (Rutherford).

Given in fractional doses colocynthin does not exhibit the drastic action of large doses. Give gr. 1-30 to 1-20, three times a day, it incites the physiologic action of the colon; repeat these doses more frequently and it causes hyperpurgation.

Colocynthin is too bitter to be given in solution. It is not suitable for chronic constipation, as if long administered or in excessive doses it may occasion ulceration of the bowel. Large doses may cause collapse in feeble patients.

Therapeutics.—Colocynthin is used as a hydragog, with others of this group; and for dropsies due to retention of abdominal glandular secretions or to portal obstruction, especially when attended by chronic nephritis. In small doses it is useful to favor the action of colon digestion. The usual dose is gr. 1-30 after meals. It acts when given hypodermically or intravenously, and in the latter case too large doses cause nephritis. In fact, this is said to occur when this drug is inhaled in the process of manufacture.

The powerful derivation by colocynthin may be utilized to relieve the hyperemic brain. When sciatica, ovaralgia or other pelvic pains are due in any part to a loaded bowel, colocynthin will give

relief. It may be given in enema and acts well, with no local irritation.

The griping caused by colocynthin in large doses may be prevented by giving with it atropine and aromatics. A good prescription is colocynthin gr. 1-33, atropine gr. 1-250, and capsicin gr. 1-67, after each meal.

Some day it will be found that no two agents possess exactly the same powers, or act on precisely the same parts of our organisms. It has long been known that we get a better effect from a union of cathartics than from any one alone, no matter how large the dose. The compound cathartic pill has held a high place and still holds it, despite the host of rivals pushed commercially. A moderate dose of colocynthin, with euonymin, iridin, leptandrin, juglandin, hyoscyamine and menthol, will give more satisfactory results as a general cathartic than any one of these agents alone.

CONDURANGIN.

Standard granule—Gr. 1-67, gm. .001.

The discovery of the remedial properties of condurango is attributed to an Indian woman. Her husband was affected with cancer; and desiring to poison him, she administered a decoction of condurango bark. Instead of killing him, however, it cured his cancer.

The plant is a vine, resembling the grape, but growing to enormous size. Ten varieties were described by Ruschenberger, of which but one, Condurango blancho, is credited with remedial properties, and this is official in Germany.

In 1871, Drs. Caesares and Eguiguren, of Ecuador, where the plant is found, advocated it as a remedy for cancer, syphilis and scrofula. The Minister of Ecuador brought it to the notice of the State Department, under whose auspices an investigation was made of the bark and its properties. The mother of Vice-President Colfax was alleged to be cured by condurango; and this, with the endorsement of some prominent physicians, aroused a whirlwind of enthusiasm over the drug, which was sold at the rate of $100 a pound. Then the adverse reports came in; Mrs. Colfax died of cancer; and the alleged remedy fell into such disrepute that its use ceased entirely in America.

Nevertheless, in Germany some quiet observers asked the ques-

tion: "What after all was there in condurango to give it such a reputation?" To their efforts to answer we owe the data presented.

In Ecuador numerous plants employed as remedies for cancer, snake-bites and syphilis, are called condurango. The true bark is probably derived from Gonolobus condurango triana, of the Asclepias family. Two or more glucosides, possibly an alkaloid, and one or more resinoids, have been found in this bark, the separation of which entails great difficulties. Antisell, Flueckiger, Schmiedeberg, Jukna, Vulpius, Reuter and Carrara, have investigated the chemistry of condurango, with varying results. The latter isolated in 1892 two bodies: Soluble condurangin, C_{20} H_{32} O_6, and insoluble condurangin, C_{18} H_{28} O_7.

Physiologic Action.—Studies have been made with Vulpius' condurangin and Jukna's resin glucoside which act alike, the resin being somewhat stronger. Their effect is most marked on the central nervous system. Small doses disturb coördination, the movements becoming ataxic, with great debility and marked impulse to move about. Respiration and pulse are unaffected, the pupils normal, the tendon and cutaneous reflexes somewhat heightened. The appetite is diminished or stopped. Salivation and emesis are frequently seen.

Large doses excite primarily, and paresis follows. There is a peculiar stiffness of the extremities. Violent cramps follow, at first tonic, then clonic. Respiration becomes shallow, the pulse rapid, the stiffening relaxes, the cramps subside, and paresis supervenes. Consciousness and sensation seem to be unaffected. The pupils dilate during the cramps, but are normal in the intervals. Respiration is retarded and superficial, the pulse small, and death occurs during a convulsive spasm, or from prostration, presumably from respiratory paralysis. The cramps are due to action on the cerebral and medullary centers, and may be checked by chloroform, chloral, morphine or curarine. The vomiting is also centric and not reflex. Condurangin does not influence the heart, the arterial tension or the intestinal muscular fiber. Direct contact with voluntary muscle, or with motor nerves, at first increases the electrical irritability, which soon subsides and finally ceases.

Nothing characteristic is found on postmortem. The lethal dose for cats or dogs intravenously is 0.02—0.03, per kilo. weight. By the stomach the lethal dose would be 0.040—0.048 per kilo. To kill rabbits the dose is 0.03.

It is evident that as yet nothing has been shown by these studies

to in any way clear up the question of the use of condurango in cancer; which must be decided by purely clinical evidence. A summary of this evidence we present.

Therapeutics.—Wilhelmy gave condurango in six cases of gastric and one of œsophageal cancer. Under its use the pains were materially reduced after the drug had been taken one or two weeks; the appetite improved, vomiting decreased, and in three cases there was a gain in weight. All but one died, though material relief had been afforded.

Hoffman obtained similar benefit in 132 cases. *In pyloric cancer it was found that prolonged contact of the drug with the stomach walls was advisable.*

In gastric ulcer brilliant results followed the use of condurango and iron, especially when anemia preceded the malady. In twenty-seven cases absolutely diagnosed (hemorrhagic, etc.), this treatment was used. Pain and hemorrhage ceased usually in four days. The drug was continued two months. Relapses were mild and soon over. In anemia this combination acted better than iron alone. In acute and chronic gastric catarrh good results were obtained.

Riess reported in fifty cases of dyspepsia, catarrhal or with dilatation, that condurango gave no advantage over ordinary bitter stomachics, if it were as good. In carcinoma, not gastric, striking benefit was rare. In thirty cases of peritoneal carcinoma, primary cancer of the gall-bladder, or large hepatic metastases, except a transient improvement of appetite and easing of pain there was no benefit. In eight cancers of the œsophagus, the dysphagia and cachexia were eased doubtfully—diet and sounds may have been the true sources of benefit.

Of pure gastric cancer, with anorexia, dyspepsia, vomiting, hematemesis, cardialgia, progressive cachexia and in time palpable tumor, he reported 120 cases observed personally and records covering 800. In none was the drug without effect. Even when first used in the last stages, in the last weeks of life, the appetite improved and euphoria occurred. The effect is far more striking when the drug is given four weeks. It is readily taken, well borne, without repugnance, for very long periods, to the amount of 10.0 grams of decoction a day.

In a few days the appetite increased, nausea disappeared, and vomiting lessened and ceased if not due to stenosis of the pylorus and ectasia. In eight to fourteen days gastric pains lessened with hardly an exception, and finally disappeared almost completely. As-

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similation improved with nutrition; the patients felt better and grew stronger, often weighed more. In most cases life was prolonged.

Of 108 cases without condurango, 70 died, 28 left unhealed, 10 left improved.

Of twenty cases treated with condurango, ten died, two were discharged unhealed, eight improved.

Of eighty condurango cases the average duration of treatment was 43.4 days. Of these 66.3 per cent died, on an average in 39.5 days; 33.7 per cent were discharged after an average treatment of 54.8 days, 24 as improved and 3 cured.

Of 116 cases treated without condurango, the average duration of treatment was 21.2 days. Of these 92.2 per cent died, average 22 days; 7.8 per cent were discharged, average 11.7 days' treatment, five improved, four not cured.

Of 64 cases in which a palpable tumor was demonstrated, a distinct decrease in its size could be shown, resulting in complete or almost complete disappearance. In all [illegible] the growth of the tumor ceased. *An increase in size of the tumor was never observed during prolonged condurango treatment.*

In three cases (two discharged as improved, one as cured) autopsies were held for death due to other causes, soon after their discharge; and the autopsy confirmed the diagnosis and the cure. In other cases the tumor decreased in size for a time but the improvement ceased, and at death the autopsy confirmed the diagnosis.

Summary: In some cases condurango completely cures gastric cancer and other gastric maladies; in many more it causes a permanent substantial improvement of all the chief symptoms, dyspepsia, vomiting, cardialgia, cachexia and tumor, and prolongs life. In the rest it caused at least transient improvement and euphoria.

Binz recommends in cancer or its suspicion, the steady use of condurango. *The effect invariably is distinctly local.*

What other remedy affords as much benefit in cancer of the stomach?

Careful study of Riess' report fails to show any reason to doubt the correctness of his diagnoses, nor that some cases of gastric cancer were undoubtedly cured by the internal administration of condurango. But the effect was distinctly and invariably local; and here we wish to make our chief point. Seemingly it has occurred to no one to use any of the bodies derived from condurango hypodermically, injected into the cancerous tissues. And yet it is evidently the step to be next taken; and surely it is worth while!

The effects of condurango in gastric ulcer are also notable; but there are other remedies for this malady, whereas in cancer we are assuredly in need of more effective weapons than those now in use. So also in other gastric maladies, there has not as yet been shown any good reason for substituting condurango for the prevailing treatment.

Riess gave condurango in decoction, 10 to 20 parts in 200, a tablespoonful several times a day. Condurangin separates by heat and redissolves on cooling; so that the decoction should not be filtered until cool.

Merck lists condurangin, a mixture of the glucosides. It is an amorphous yellow powder, of aromatic bitter taste, soluble in alcohol, water and chloroform. Dose 0.0065 to 0.016 three times a day (gr. 1-10—1-2). We would recommend 0.001 (gr. 1-67) as the beginning dose hypodermically, rapidly increased to 0.005 or more, in watery solution, injected into the substance of any cancerous tumor in reach.

CONVALLAMARIN.

Standard granule—Gr. 1-12, gm. .005.

From the lily of the valley are derived two glucosides, convallarin, a cathartic, and convallamarin, on which the heart tonic virtues of the plant depend. This principle closely resembles digitalein, being freely soluble in water.

Physiologic Action.—Marme has made the following summary of the action of convallamarin upon the vascular pressure:

1. The normal arterial pressure is augmented, generally with slowing of the pulse.

2. This increased pressure continues while the pulse becomes faster than normal.

3. The pressure continues high while the pulse becomes irregular in frequency and in force.

4. The pressure falls swiftly, the heart is arrested, and the subject dies.

The action of convallamarin is especially directed to the heart and is according to Boehm absolutely independent of vasoconstriction from excitation of the vasomotor nerves.

Van Renterghem records the following observations made on his own person with Merck's convallamarin.

The first day he took gr. 1-12 every half-hour till 20 doses had been taken. No effect was manifested except that by evening the

pulse was more developed. Next day the dose was doubled. In the afternoon, rattling in the stomach; in the evening two soft stools, no abdominal pain—that day he had taken no saline in the morning. The pulse was 82 in the morning, 80 at 10 p. m. During the night, one soft stool.

Third day: Took gr. 7½, between 11 a. m. and 9 p. m. The pulse gained in energy but the rate was unaltered. Digestion was unaltered except for the increased peristalsis.

During the day there were five small stools, in the evening some abdominal pains; during the night two more stools. Next morning he took a saline, as in spite of the laxation he felt some toxemic fever. The pulse was more forcible than usual and the rate was up to 110. Temp. 99.3, heart and temples beat strongly; slept. Awakened at 1 a. m. by a violent peal of the bell, he was obliged to go in a carriage a quarter of an hour, during a "time of ice," for a laborious confinement ended by the forceps. The duty was performed with difficulty; the traction fatigued beyond measure and caused nausea with difficulty restrained. The heart and arteries beat strongly and more frequently. By 7 a. m. the rapidity of the pulse had lessened; at 8 two good stools and sufficient urine, after saline. At 9 a. m. *cafe au lait.* The pulse was perfectly calm and had fallen to 80. No abdominal symptoms.

His conclusion was that doses of gr. 1-12 to 1-6 every hour do not lessen the pulse rate, but increase its force with the increase of arterial pressure. Doses of gr. 1-3 to 2-3, repeated, produce the beginning of paralysis of the pneumogastric nerve, as shown by feverish rapidity of the heart beats. No marked effect was noted on the renal functions. The drug evidently did not accumulate in the body.

Shoemaker says that convallamarin sometimes causes hemoptysis, dyspnea and other disagreeable symptoms.

Therapeutics.—Convallamarin has been used in heart diseases, especially those of the mitral valve. When compensation fails it strengthens the heart, increases the excretion of urine, and quickly relieves dyspnea and palpitation. In angina pectoris and functional affections of the heart it has also proved beneficial.

Janowski recommended it in renal and cardiac dropsies. In cirrhosis of the liver it acts as a diuretic. In chronic nephritis it strengthens the circulation, relieves dyspnea, increases the urine, reduces dropsy and lessens albuminuria (Shoemaker). We may doubt whether its occasional good effect in asthma is due to a relaxa-

tion of arterial spasm. More likely it is in cardiac asthmas that convallaria finds a place.

It is sometimes useful in neuralgias, insomnia, and to quiet the restlessness of fever. The palpitation and dyspnea of febrile phthisis are mitigated by it.

See valued convallamarin above all other remedies, even digitalin, in cardiac dropsies.

King gives as specific indications for it: Heart irregularities due to mechanical impediments; mitral insufficiency; dropsy of cardiac origin; palpitation and vehement heart action, with arrhythmic movements, dyspnea and diminished arterial pressure; quickened pulse with capillary obstruction.

The place of convallamarin may be summed up by saying that it replaces digitalin in the whole line of its action and uses, but does not unsettle the stomach as the foxglove sometimes does, and acts on the bowels slightly. When of good quality it may be used as an alternant with digitalin. But we have found no evidence to show any further applications in therapeutics.

COPPER ARSENITE.

Standard granules—Gr. 1-250, gm. .00025; gr. 1-1000, gm. .000062.

This is a well-known remedy for all acute derangements of the intestine. It has been recommended highly in "indigestion" especially when pain is experienced after eating. Its chief use, however, is as an antidysenteric: Gr. 1-1000—or even a smaller dose—may be given every fifteen minutes for four to six doses and then the same quantity repeated every hour or two. The indications are all forms of acute diarrheas, cholera infantum especially yielding to this remedy if the bowel is first cleansed thoroughly. In this disease the drug should be administered in small but often-repeated doses. Gr. 1-100 may be dissolved in twenty teaspoonfuls of water and a teaspoonful given every ten minutes for three or four doses and then every hour till relief. In a short time tenesmus and tympanites cease, the stools become less frequent and those which are passed are free from the typical odor which the early dejections present. In the more chronic diarrheas and dysentery, gr. 1-500 or even gr. 1-100 may be given every three hours till a marked improvement is noticeable.

The drug is also recommended as a remedy for dysmenorrhea and sometimes its administration is followed by marked improve-

ment. Gr. 1-100 may be given three times daily for three days prior to and during the early part of the menstrual period.

CORNIN.

Standard granule—Gr. 1-6, gm. .01.

Cornin is a concentration from the Cornus florida, or dogwood. Geiger obtained from this bark a bitter crystalline principle, cornine; soluble in water and alcohol.

Felter and Lloyd state that dogwood is tonic, astringent and slightly stimulant. It has been much used as a substitute for quinine in ague, and in typhoid fevers. It increases the strength and frequency of the pulse, and elevates the bodily temperature. It relieves quinine headaches, pyrosis and general exhaustion.

Specific Indications.—Tonic antiperiodic, intermittent and miasmatic fevers; pyrosis; quinine headache; general exhaustion; feeble relaxed tissues; feeble pulse and subnormal temperature; quinism.

Ellingwood advises cornus for atony of the gastrointestinal glands in malaria, and to antidote the malarial poison; increasing appetite, it improves digestion, relieves drowsiness and dullness following imperfect digestion; also improves intestinal digestion.

This meager account gives very little information as to this remedy, which we are convinced is worthy of extended investigation. For some years the writer has given cornin for weakness of the erectile tissues, and believes it the best remedy for this condition yet introduced—far superior to yohimbine. The effect of cornin is that of a tonic, slow to be manifested but enduring long. The dose for this purpose is a grain four times a day, and it should be continued a month at least. It is by no means a cure-all, for the condition may depend on any one or more of several pathologic elements, and each case requires study. With many men the restoration of power is followed by renewal of the excesses that first induced the exhaustion, and this obviously will not be, and should not be, cured by any treatment. But cornin is a valuable agent in restoring erectile tissue when not entirely beyond the reach of remedies.

This points to the probable value of cornin in other forms of debility, and altogether this agent deserves study at the hands of those who do not consider the whole story of the tonics comprised by iron, strychnine, quinine and cod-liver oil.

As a remedy for ague cornus was employed largely in the South during the civil war, and gave satisfaction. But the crude prepara-

tions alone to be had were brought into competition with the modern representative of Peruvian bark, quinine, and obviously only decided superiority could overcome such a handicap. The crystalline cornine should be isolated and tested fully by modern methods.

CORNUTINE.

In 1884 Kobert discovered cornutine in ergot. It is an alkaloid, amorphous, little soluble in water, but the salts easily soluble. Kobert and Lewitzky attribute to cornutine the specific action of ergot on the uterus. By irritating the uterine center in the lumbar cord it evokes arrhythmic contractions of that organ. In non-pregnant animals these contractions only occur in late stages of poisoning by cornutine, but in pregnant animals the uterus is first affected. The pains are more violent the nearer the animal is to full term. Tetanoid contraction of the uterus was not observed, even after large doses.

Toxic doses cause convulsions, by centric irritation. Small doses increase the reflex excitability of the cord, while large doses paralyze it. Very small doses slow the pulse by irritating the pneumogastric, and very large doses paralyze it. The blood-pressure is vastly increased. This is followed after large doses by paralysis of the vasomotor center and a corresponding fall of the pressure. The striated muscles are also affected causing stiffness similar to that caused by veratrine. Lethal doses cause death by paralyzing the respiratory center. Both stomach and bowel contract powerfully under cornutine.

Another body was discovered by Kobert in ergot, to which he gave the name of sphacelinic acid. This produces gangrene; and one of the advantages of employing cornutine is that this acid is thereby left out.

Lewitzky says cornutine is the surest means of exciting uterine contractions, whether the organ is pregnant, or enlarged from chronic metritis, or after abortion. The indications are therefore the same as for ergot.

Meisels used cornutine successfully for urethral and vesical hemorrhage in paretic spermatorrhea. The citrate is preferred. Dose, gr. 1-33 to 1-6. It is not well suited for hypodermic administration. Cornutine keeps better than other ergot derivatives, especially when kept dry. The price is as yet too high for extensive use —a dollar a grain is Merck's price.

THERAPEUTIC NOTES

THERAPEUTIC NOTES

Until the cost is within reason the best preparation of ergot accessible is Bonjean's ergotin, a watery extract. When prepared by the best makers this is fairly uniform and active. It has the very great advantage of being readily used hypodermically.

Acute poisoning by ergot has been noted after attempts to secure abortion. The symptoms are collapse, weak, rapid pulse, tingling, itching and coldness of the skin, unquenchable thirst, vomiting and diarrhea, confusion or unconsciousness, uterine hemorrhages, abortion and jaundice. Subcutaneous and internal ecchymoses were found (Cushny).

Chronic poisoning from the use of ergotic rye is still seen in Russia. The symptoms fall into two groups, the gangrenous and the nervous.

The gangrene occurs in the fingers and toes, extending along the entire limb, which is cold, anesthetic, dusky, then dry, hard and shrunken, falling off with slight pain and no hemorrhage. In mild cases only the skin is affected. Internal necrosis may occur, causing cataract, ulcers of the bowel, stomach, lung or uterus. Abortion is uncommon.

In the neurotic form there are depression, weakness, drowsiness, headache, giddiness and paresthesiæ. Paroxysmal convulsions occur, clonic, epileptiform, followed by contractures of the limbs, sometimes of the trunk. Mental debility even to dementia may ensue.

The accounts given of the action of ergot, therapeutic and toxic, are so contradictory that little value is to be attributed to them. It is evident that the various preparations of this drug vary greatly as to the nature and proportions of their active constituents. No definite effect is to be expected from such uncertain agents. For instance, many observers credit ergot with the power of causing uterine contractions and an equal number deny that it can initiate these movements. Most physicians believe that it causes tetanic contractions of the uterus after parturition has commenced, but others deny this. It would seem that an agent so uncertain had better be left out of practice; but since the desired effect can surely be obtained from cornutine, there is no reason we should deny ourselves of its great benefits.

Ergot has been applied locally for gonorrhea, acne, rosacea, conjunctivitis, endocervicitis, and incipient boils (Shoemaker); also for hemorrhoids, prolapsed rectum, relaxed sphincter ani or vesicæ; but there seems much doubt as to whether an agent acting

upon the centers as ergot does, can exert any local action beyond suggestion. T. Clemens gave ergotin by the stomach and injected into the bladder (4 grains to the ounce) for ammoniacal cystitis of paraplegics, with advantage.

Every variety of hemorrhage has been stopped by ergot in sufficient doses, though Binz denies its efficacy except in uterine hemorrhages. In these it has been the writer's experience to find the bleeding reduced by ergot to a mere dribble, but this refused to stop even when the drug was given till the legs grew cold and the pulses at the ankle were imperceptible. But when digitalin was then given the remaining hemorrhage ceased. This was in postpartum bleeding. When the hemorrhage is from uterine tumors, polypi or fibromyomas, there is evidence that ergotin checks the bleeding and reduces the growth by cutting off its blood supply and constringing the uterus. Mechanical means may be employed to facilitate the separation and extrusion of the tumors.

In labor when there is a history of previous floodings, it is customary to give a full dose just as the child's head is ready to be born—presses upon the perineum, the latter dilated properly.

In uterine subinvolution Hirst recommends ergot with strychnine and quinine.

Night sweats, hyperidrosis, galactorrhea, have been treated by ergot. In purpura it is usually given, but the writer has never witnessed any good effect from it. In relaxed states, as in diarrheas, dysenteries, passive pulmonary congestions, etc., ergot may be of value but strychnine fills this indication so well that nothing else is needed.

In diabetes insipidus the outflow of urine is controlled to some extent by full doses of ergotin, and it has been used in glycosuria also. The powerful vasoconstrictor effect of ergotin has been utilized in treating congestive dysmenorrhea and migraine, spinal hyperemia, vesical paralysis, whooping-cough, etc. It has been injected hypodermically for varicose veins, varicocele, enlarged spleen, and hemorrhoids. In acne when enough ergotin is given, the malady completely disappears, but returns when the ergot effect passes off.

In many affections of the nervous centers, brain and cord, ergot in full doses has been advised, such as spinal hyperemias, paraplegia, chronic mania with hyperemia, in fact in any hyperemic malady of these tissues.

Paretic spermatorrhea is said to have been benefited by this drug.

Gossypiin, hydrastine, physostigmine and pilocarpine cause uterine contractions and are synergists of ergotin in that respect.

Digitalin, hydrastine, hydrastinine, are synergistic as hemostatics.

Ergotin has been given to restrain too free mucous discharges, leucorrhea, etc. It has been injected hypodermically over aneurisms with benefit. In a case of pulsation of the abdominal aorta where ergotin was employed under the mistaken diagnosis of aneurism, recovery ensued.

The dose of ergotin by the mouth is gr. 1-6 to j, repeated every hour or less, as needed. In acute hemorrhages or to stimulate the uterus it may be given hypodermically in single doses of three grains every four to eight hours. In nervous maladies Wood gave fluid extract of ergot in doses of a dram to an ounce; but this preparation is so uncertain that little definite information as to dosage is to be derived from it.

The effects of ergot are not manifest for some hours after administration.

CORYDALIN.

Standard granule—Gr. 1-6, gm. .01.

Corydalin is a concentration from the tubers of Corydalis formosa, the turkey corn. The plant contains an alkaloid, corydaline, discovered by Wenzell. It is insoluble in water, soluble in ether easily, with difficulty in alcohol, Merck describes three alkaloids found in this plant. By the eclectics corydalis is accredited with tonic, diuretic and alterative properties. It was employed as a remedy for syphilis but except as a tonic is not thought to possess any value (King). When syphilis is constitutional, in debilitated subjects, corydalis possesses an efficacy unequalled as an alterative tonic (King). Recent syphilitic nodes, especially on the skull, are chiefly influenced by it. It promptly relieves the shin pains. Locke recommends it in atonic, scrofulous and syphilitic cases of amenorrhea, dysmenorrhea and leucorrhea; also as a digestive tonic in atonic abdominal enlargement, dysentery and diarrhea with coated tongue, fetid breath and poor digestion. It is useful in malarial cachexia.

Specific Indications.—Syphilitic or scrofulous diathesis; yellow skin with lymphatic enlargements; syphilitic nodes; increases waste and improves nutrition.

Ellingwood says overdoses cause biliousness, deranged stomach, excessive secretion of mucus, gastrointestinal catarrh, anorexia, indigestion, fetid breath, irregular bowels, colic, and malaise. In remedial doses it is a tonic, increasing vitality and influencing metabolism; coöperating with echinacea, berberis, hydrastis, xanthoxylum and stillingia. In chronic skin diseases with marked cachexia it is speedily curative; superior if there is relaxation of tissue and plethora.

The dose of corydalin is a grain four times a day in chronic conditions.

COTOIN.

Standard granule—Gr. 1-67, gm. .001.

Cotoin is a glucoside derived from the bark of an undetermined South American tree. It is soluble in alcohol or ether, or in boiling water, almost insoluble in cold water. Watery solutions of alkalies or of their carbonates dissolve it.

Coto has the properties of a bitter tonic and of an astringent. It has been used as a remedy for various forms of diarrhea with success. Burkhart and Rieker attributed to it extraordinary efficacy in enteritis, diarrhea, dysentery, etc. In cholera infantum it acts as other astringents do. In phthisis it is more effective, and also restrains the colliquative sweats. Engel asserted that it had a selective action in tubercular diarrhea, so that any diarrhea checked by coto might thereby be diagnosed as tubercular. Cotoin is especially useful where opiates are contraindicated.

Large doses of coto cause a sense of warmth in the stomach, and larger ones give rise to nausea and vomiting. The saliva is increased. It retards the development of bacteria, and of putrefaction. It actively dilates the intestinal vessels. In healthy persons it does not constipate. Shoemaker pronounces coto remarkably efficient in all forms of diarrhea except that with intestinal ulcers.

Albertoni reported no success in drunkards or when the portal circulation was obstructed, as in cirrhosis. Enteric hyperemia and tendency to intestinal hemorrhage contraindicate coto. In acute intestinal catarrhs it should therefore be used with care.

The dose of cotoin is gr. 1-67 to 1-22 every two hours.

Coto is singularly repugnant to the stomach, and few patients will take it long, the aversion becoming insurmountable (Huesemann).

Cotoin does not interfere with the action of pepsin or of ptyalin. It is excreted by the kidneys and diminishes the excretion of indican. Insoluble in the gastric juice it passes unaltered into the intestine. The intestine, says Albertoni, is the habitat par excellence of the putrefactive process. Here we encounter nearly all the products of the putrid fermentation, peptones, tyrosine, leucine, organic acids, phenol, indol, scatol, ammonia, carbonic acid, sulphydric acid, hydrogen, hydrogen protocarbonate. The majority of these are reabsorbed, and traces of phenol are found in the stools, most of it in the urine. The indican of the urine is derived from the indol. The quantity of indican found in the urine shows the intensity of the putrefactive process in the bowel. Albertoni found that phenol continued to be found in the urine despite the use of cotoin. The decrease of indican observed by Burkart and Pribram under cotoin must be attributed to a secondary effect, consecutive to the amelioration of the intestinal malady. By determining active dilation of the intestinal vessels cotoin improves the nutrition of the mucosa and increases its faculty of absorption.

It follows that the indication for cotoin in diarrheas is asthenia, the atonic or relaxed condition. Van Renterghem found this agent useful for aged patients. In children the diarrhea of rickets is especially amenable to cotoin. Much larger doses than those above given may be used. Albertoni gave gr. 1-6 to a newborn infant with impunity. Van Renterghem gave to an adult ten grains within 24 hours.

CREASOTE.

Standard granule—Gr. 1-67.

Despite the differences of opinion regarding the usefulness of creasote in phthisis it will continue to be given in this disease until something else has proved more efficacious. It is a powerful antiseptic resembling carbolic acid greatly in its effect but is markedly less injurious to the human tissues. It is eliminated through the lungs and bronchial mucosa and though it cannot possibly destroy the bacilli in the lesion it probably renders them weaker and certainly renders the parts a less suitable field for their propagation. It also disinfects the sputum and this is of no small moment for to render the discharges of the phthisical patient less dangerous to himself and others is to accomplish a good deal. The consumptive often reinfects himself. This is unquestionable. The drug is also eliminated through the kidneys and this has lead to its use in

diabetes and Bright's disease. While it is impossible to term it a remedy for these conditions some cases have improved upon it. Creasote destroys germs with which it come in contact and thus is of use in stomachic and intestinal fermentative conditions. It is also an excellent anti-nauseant. It can be given combined with bismuth in all forms of nausea with success.

The dose in phthisis should be large. Three to six granules may be given every three hours. An excellent plan is to begin with two and gradually increase as the patient becomes tolerant. Some subjects can take enormous doses and thrive upon them. The secret of success with this remedy in pulmonary phthisis is "dose enough." In purulent pneumonitis creasote will prove invaluable. Two to four granules may be given with some nutrient every three hours. In bronchitis and bronchorrhea it corrects the offensive discharges and certainly aids in obtaining a cure. In such cases as are suited to this remedy, cough lessens, sputum diminishes, night sweats cease and diarrhea (if present) stops. Vomiting is controlled, the gastric irritability lessens and the patient shows general improvement. Creasote should be given either with food or with a diluent. It is a useful and dependable remedy and should be in every doctor's case.

CROTON OIL.

Croton oil may be separated by alcohol into two portions, that soluble in alcohol being irritant, the residue purgative. The former depends on crotonolic acid for its effects.

Applied to the skin croton oil causes a pustular inflammation or eruption, sometimes leaving scars. The vapor may cause inflammation of the conjunctivæ, nose and air-passages. Burning follows its local application in five minutes. The pustules dry up and disappear in a few days. Sometimes the oil is absorbed and causes purging, even through the unbroken skin. Applied to wounds or denuded surfaces it causes phlegmonous inflammation, with suppuration.

Taken internally in doses of a drop, croton oil causes burning and irritation of the mucous surfaces with which it comes in contact. Within two hours abdominal rumbling and pains begin, with watery stools that irritate the anal tissues. Larger doses cause symptoms resembling cholera morbus, violent vomiting, aching in the muscles and joints, cyanosis, fall in temperature and death.

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Three drops may cause violent gastroenteritis. Five drops caused death.

Croton oil is given as a derivative in congestions of the brain or spinal cord, threatened apoplexy, etc., and eclampsia, where there is need of prompt and powerful effect. In obstipation and intestinal obstructions it is a very dangerous drug, and does infinitely more harm than good.

The average purgative dose is one drop. Some believe that croton oil in smaller doses acts mildly, like castor oil; and it has been given in pills of soap containing each one-tenth of a drop of croton oil with asserted benefit. The oil from which the acridity had been abstracted by alcohol might be thus used, and possibly we could thus obtain in a granule or tablet the virtues of the bulky and disagreeable but valuable castor oil.

There is a popular belief that [illegible] will cure the alcohol habit; and the writer has been asked to prescribe it in doses of a dram. [illegible] half a dram each [illegible] dose. [illegible] and accomplished a cure. [illegible] similar dose [illegible] that the oil was [illegible]

Locally the oil [illegible] counterirritant [illegible] needs it [illegible] of absorption [illegible] [illegible] beneficial [illegible]

[illegible]

[illegible]

[illegible]

which make them somewhat more irritating to the intestinal tract than is cubebin.

Its chief use is in disorders of the urinary passages. In gonorrhea and gleet its action is well known. It acts as a sedative to the mucous coat and seems to allay irritability. The standard granule contains gr. 1-67, and one, two or three may be exhibited every hour.

As an expectorant one every two hours often gives good results. Scillitin may be given in conjunction and cubebin and codeine, one granule of each, has relieved some markedly stubborn cases of bronchial asthma. In arresting the discharge following acute prostatitis cubebin is useful and it has been recommended as a remedy for spermatorrhea. In catarrhs of the bladder it is of undoubted value; indeed, it is here that its chief field exists. It should not be forgotten that large doses sometimes cause a marked feverish condition with some erythema.

CURARINE.

From the Indians of the Orinoco is obtained an arrow poison known as curare. Three kinds come to the market, that which is brought in tubes of bamboo, in calabashes, and in little clay pots. These are different in their effects and strength. Five alkaloids have been found in these, the most important being curarine.

This is a bright reddish-yellow amorphous mass, that from tube curare being quite stable, soluble in water or in alcohol.

Curarine given in large doses hypodermically, paralyzes the striated muscles, beginning with the short ones, the ears, toes and neck, then those of the extremities and finally the respiratory apparatus which gradually comes to a stop. The heart continues beating a while longer and then also stops. Small doses weaken the voluntary muscles alone, the respiration becoming labored but do not affect the heart.

The rationale of this action is disputed, though it evidently takes place through the blood. The ends of the motor nerves are paralyzed, but neither the trunks nor the centers. The metabolism as represented by the exchange of gases is markedly lessened, from the muscular relaxation. To this is also due the fall in temperature.

The earlier experiments with curare are inaccurate from the varying nature of the specimens, but Tillie employed pure curarine

and his results are of value. He found that small doses abolish the posterior reflexes, by cerebral inhibition. Large doses affect the spinal cord directly, increasing irritability and causing convulsions, increasing to tetanic severity. This follows only direct application of the drug to the cord.

When curare slows the heart, reduces the arterial pressure and arrests the heart in diastole, it is due to the other alkaloid, curine, not to curarine. To which principle is to be ascribed the lachrymation, polyuria and salivation following some curares, is uncertain. The skin is at first dry, followed by an outburst of perspiration, dryness of the mouth and burning thirst. The temperature rises nearly two degrees.

Chattering of the teeth, shivering and trembling precede the pareses.

Taken by the mouth, curarine has little if any effect, even in very large doses. Either it is destroyed by the gastric juice or the absorption does not more than keep pace with the elimination.

Curarine has been employed in affections characterized by excessive irritability of the motor terminal nerves, such as tetanus and hydrophobia. Two cases of the latter have been reported as cured by this remedy. The great difficulty in obtaining it in purity, and the variable effects manifested by the curares sent to market, have prevented its general employment in affections of such gravity. Cushny considers curare not indicated in these maladies, which depend on centric irritations, while the drug acts only on the nerve-ends. But Murrell speaks highly of the use of methyl-iodine-strychnine, whose effects are identical with those of curarine, and which may be prepared in uniform strength and purity sufficient to justify its employment. In paralysis agitans, chorea, and a number of similar maladies this agent should prove of decided value.

Curarine seems to be excreted unchanged by the kidneys. It has been given in epilepsy with asserted advantage. The dose to begin with is gr. 1-250, hypodermically, increasing till effect. In hydrophobia Offenberg gave gr. 1-2 to a woman and saved her. In strychnine poisoning curare has been used with success. Here it seems to be a rational antidote. In tetanus Hoffman gave curarine gr. 1-67, increasing to 9-67, hypodermically. A case of tetany is reported in which doses of gr. 7-67 proved effective.

Curarine may be administered by the rectum, in doses somewhat larger than by hypodermic.

CYPRIPEDIN.

Standard granule—Gr. 1-12, gm. .005.

Cypripedin is a concentration from Cypripedium pubescens, the ladies' slipper. No active principle has been found in this plant.

Scudder terms cypripedium tonic, stimulant, diaphoretic and antispasmodic. Its chief value is as a nerve stimulant in atonic cases, improving the circulation and nutrition of the nerve centers. Felter and Lloyd enumerate as its uses, allaying nervous excitability or irritation unconnected with organic lesions, lessening pain, producing a calm and cheerful state of mind and thus favoring sleep; hysteria, chorea, nervous headache, wakefulness, prostration in low fevers, epilepsy, all morbid irritabilities of the nervous system from non-organic causes; nervousness, hypochondria and mental depression of deranged digestion, especially in females; joint pains following scarlet fever.

Specific Indications.—Insomnia, nervous irritability, neuralgia, delirium, all from atony; menstrual irregularities with despondency; tendency to dementia at climacteric; mental depression from self-abuse.

Ellingwood says the virtues of this plant are lost by drying, and only fresh root preparations should be employed. Large doses are requisite. He advises it in nervous conditions from genitourinary disorders; mental depression from sexual causes; it allays cerebral irritation from teething; typhoid vigilance and jactitation with vital depression, and that from dyspepsia.

These quotations show the place of cypripedin to be close to that formerly filled by valerian. Neither is a powerful remedy, but for them there is a large class of cases that do not require a very strong remedy. It is the little ailments that wear out the endurance, as bankruptcy is more easily borne than the continual nagging of a nervous, fretful wife. Cypripedin relieves the minor ailments that cause nervousness, and leaves a sense of comfort and well-being, somewhat resembling the euphoria of morphine. Possibly cypripedin may prove of value in treating the withdrawal symptoms of this and other habit drugs.

The writer has employed cypripedin largely to relieve sexual erethism, with satisfaction. It soothes the sexual organs and quiets the irritability that leads to the exhaustion of the forces by constant discharges of energy. The patient must be warned that the effect will be a lessening of sexual desire, or else he will think it is de-

priving him of his powers. Explain that the energy is simply stored up by cypripedin instead of being uselessly discharged, and he will be satisfied. This result has followed the use of cypripedin in both sexes.

The dose most effective has been a grain four times a day, and the drug should be continued for a month. It is often wise to give cypripedin for a month and then follow with cornin for a similar period.

Cypripedin is one of the remedies lost to the old therapist by the uselessness of the preparations in the shops. While a freshly-made infusion probably excels, the writer has found cypripedin quite active.

DIASTASE.

Standard granule—Gr. 1-6, gm. .01.

This substance is an enzyme, a name used in organic chemistry to designate unformed ferments as distinguished from organized ferments.

Diastase is obtained from barley and other cereals when in process of germination. It is a saccharifying or amylolytic ferment, which has the power of slowly converting starch into grape sugar, with the intermediate body maltose. To the saccharifying enzymes belong this body, diastase, ptyalin, and the diastasic ferments of the pancreas, liver, blood, mucosa, of the trachea, and gall-bladder, spleen, skin, kidneys, testicles, lungs, lymphatic glands and muscles.

In the vegetable kingdom these saccharifying enzymes are very abundant, as in the buds of leaves and in germinating seeds; especially of the cereals and legumes. There is also an enzyme derived from the bacterial fungus of rice, Aspergillus eurotium oryzae, called after its Japanese discoverer Takamine, Taka diastase.

Diastase may be found in small quantities in malt extracts, when care is taken not to disperse this substance by the heat employed in making the extract. Whether the animal diastases are identical with those of vegetable origin is yet a question. But assuming that ptyalin, the diastasic enzyme of the saliva, is at least very nearly identical with vegetable diastase, and remembering too that omnivora and carnivora produce ptyalin but very little or not at all, while herbivora produce it abundantly in their saliva, we come to the reasonable conclusion that diastase must be useful in amylaceous indigestion; and so it is found in practice.

Cushny doubts the existence of such an indigestion. In his Pharmacology, page 688, he says: "Taka-diastase, which digests over 100 times its weight of starch, has been recommended in cases in which there is supposed to be a deficient digestion of starch. It ceases to act in the gastric juice as soon as the acidity exceeds 0.1 per cent, but may be able to digest a certain amount of starch in the mouth and stomach before it is destroyed. The question at once arises however, whether the ordinary digestive juices are ever unable to digest the starch of the food. And although a new term, amylaceous dyspepsia, has been introduced to indicate this class of cases, if they should be found to exist, it must be admitted that no satisfactory evidence of their existence has been brought forward as yet. It is stated that more starch is found to be digested in the stomach after the administration of diastase, but this seems to be beside the point, for it merely indicates that less starch reaches the intestine for the pancreatic juice to act upon. Until it is shown that in some cases the digestion of starch by the intestinal ferments is insufficiently performed, the diastase preparations would seem to be superfluous. According to Friedenwald diastase increases the digestion of starch in the stomach chiefly in cases of hyperacidity; but doubt is thrown upon this statement by the investigator."

Practice, however, does not sustain this skepticism. We do meet with cases where starchy food is badly digested and eructations of odorless gas follow its ingestion, in which diastase serves an excellent purpose. Moreover, diastase hastens the natural amylolytic or saccharifying process. The usefulness of diastase in diabetes mellitus, especially from pancreatic disturbances, when the withholding of bread becomes intolerable and it must be allowed to some extent, rests upon this hastening quality. What exhausts the patient here is the protracted slow process of the saccharification of starch. It seems, therefore, that when this process is quickly performed and the sugar gotten rid of by the excretions, this is the cause of the patient's comparative relief, and this gives him a better chance for other appropriate treatment.

Diastase is an albuminous body, obtained by precipitation from a watery malt extract, as a white powder. The minimum dose is gr. 2, and reasonably more when indicated.

As with the other artificial digestants, the effects of a few grains of diastase are immensely greater than those attributable to its own digestive powers. The function of these bodies seems to be to set the digestive process going. The secretion of the natural digestants

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l in the body appears to be regulated automatically, and ıen enough has been provided for the need. But sometimes ion is not begun, and food may be vomited hours after its without any sign of digestive action. Now if the digesgun by artificial agents, it seems that the process once set ion is continued by the forces of the digestive system, until l. This explanation is in harmony with the facts observed

ıse acts only upon the carbohydrates, and only during the ɔeriod of digestion. It should therefore be given only at ning of the meal, and with starchy food. As soon as the ;astric acid begins the action of diastase ceases, and it is ;ly doubtful if it is resumed later in the duodenum, as the is itself almost certainly digested in the stomach. Even arly indicated the use of diastase should not lead the to neglect the necessary instructions to his patient as to ating. If people thoroughly masticated and insalivated rates and did not wash their food down with fluids, espel ones, there would be little need for diastasic aids.

DIGITALIN.

ırd granule—Gr. 1-67, gm. .001.

the leaves of the foxglove, Digitalis purpurea, we obtain est of the cardiac tonics. The leaves contain at least five s, known as digitin, digitalin, digitalein, digitoxin and . Of these the first is admitted to be inert, the next three each other in their effects as cardiac and vascular tensors etics, while the fifth to a certain extent antagonizes the f the others. These active principles exist in the plant in ɔroportions. The strongest digitalis is said to be the wild England; that found in Roumania is very much less active, cultivated herb is inert. The plant is a perennial and only s of the second year's growth should be employed. The : only active within a year from the time they are gathered. the irresponsible herb collector cares for such nicety, or if s the wild plant when it is so easy to cultivate, are questhose who adhere to the use of galenics—the alkalometrist something more definite and sure.

digitalin is a white amorphous powder, formula C_{29} H_{38} lissolves with difficulty in water, easily in alcohol or chlorohe solution is very bitter. It is precipitated by tannic acid.

Physiologic and Toxic Actions.—A lethal dose of digitalin paralyzes the heart, arresting it in diastole. The pulse is first slowed, the arterial tension increased. The pulse is then accelerated, the blood pressure falling slowly and progressively, interrupted by brief elevations. The heart-action becomes very irregular, pulse-rate variable, arterial pressure continually falling; finally, sudden heart paralysis and arrest in diastole.

Traube describes three stages: The arterial pressure rises and the pulse slows; the pulse-rate rises suddenly to its maximum, as in atropine poisoning, the arterial pressure rising at the same time, but soon beginning to sink gradually to below normal; the pressure still sinks, the pulse again slowing, intermitting and irregular, the beats weaker, finally stopping in diastole.

Small doses have no appreciable effect on the nerve centers of a healthy man. They sedate the nerves and favor calm and sleep, when there is agitation and insomnia (Rabuteau).

Toxic doses, or even smaller ones too long continued, provoke vertigo, headache, obscurity of vision, dilation of pupils, ringing of the ears, hallucinations, muscular weakness, dulling of the senses and the general sensibility, sometimes convulsions. These are due to the circulatory disturbance and the increase of carbonic acid in the blood.

In small doses digitalin does not weaken the contractility of the voluntary muscles but in large doses it extinguishes it rapidly. Small doses excite the contractility of smooth muscle fiber; large doses lessen or abolish it.

During the first stage the thermometer in the anus shows a fall of temperature, while at the surface of the body the heat is augmented. This is explained by the increase of the arterial pressure, the acceleration of the cutaneous circulation, and the radiation of heat. The fall of temperature in the following stages, and in fevers, is explained by attributing to digitalin the power of removing the causes of abnormal hyperthermia, or of indirectly diminishing the molecular changes and the production of heat, by slowing the circulation.

Small doses of digitalin produce no notable effect on the gastro-intestinal tube of a healthy person. Larger ones cause nausea, anorexia, vomiting, gastric disorder and diarrhea (Koppe).

Digitalin is not a true diuretic, and has no value as a renal eliminant unless the defective action depends on heart-disease. In healthy persons by raising the arterial pressure it lessens or sup-

presses the discharge of urine. Sometimes the excretion is reëstablished as the pressure falls; in others it only returns when the pressure has become subnormal. Here the renal vasomotors seem to be affected more than the general system. After these arrests the urine is always albuminous. But other elements may enter to explain the action on the excretion of urine. Increased arterial pressure may check it by mechanical action.

The slowing of the pulse in the first stage is attributed by Traube to direct excitation of the centers and peripheric intracardiac ends of the vagus. Meyer looks on the slowing as secondary to the increased vascular pressure, the intracranial tension acting on the vagus centers. This regulates automatically the discharge of blood into the cranium. But Traube found that cutting the cervical cord—which lessens arterial pressure universally—does not prevent the slowing of the pulse by digitalin. Binz does not consider these views antagonistic.

How digitalin increases the blood-pressure is no better comprehended. Binz attributes it to a direct action, since neither atropine nor section of the inhibitory nerves prevents it. Traube attributes it to excitation of the cardiac excitomotor nerves. But as on the excised heart of the frog digitalin acts precisely as on the heart of warm-blooded animals *in situ*, there seems to be a direct relation between the drug and the cardiac muscular fibers. On the contrary, Achermann and Kaufmann consider that by acting on the vagus centers and peripheric terminals, it augments the intravascular pressure. Binz says the arterial pressure depends on three factors: Increased energy of ventricular contraction; increased frequency; greater resistance from increased systemic vascular tonicity.

The unquestioned diuretic property of digitalin in cardiac dropsies is thus explained: There is here often a serous transudation into the tissues, due to the enormous passive venous hyperemia. Digitalin regulates the abnormal distribution of the blood, removes the hyperemia, and permits reabsorption of the effused serum. The aqueous blood, and the general increase of vascular pressure, especially in the renal arteries, conduce naturally to hypersecretion of urine (Nothnagel). Gubler calls attention to the corresponding diminution of perspiration, for while the activity of the sudoriparous glands is in proportion to the peripheral congestion and exaltation of the temperature, that of the uropoietic glands is in inverse ratio to the vascular erethism.

The urinary flux requires two opposite conditions: The absence

of sanguineous congestion of the kidneys, the expansibility and perfect contractility of its vascular apparatus, as well as the rapid circulation of the blood in the interior of the gland. Increase of tension becomes then an accessory circumstance. The energized cardiac contractions have more importance; they accelerate the flow of blood into the renal parenchyma, and contribute powerfully to the definite result. The diuretic action of digitalin is the more pronounced, the more directly the anuria is dependent on the disorder of the circulation; and the aqueous plethora or the serosity in closed cavities or cellular tissues is the more abundant.

Digitalin causes no local effects when introduced into the cellular tissues.

Digitonin, C_{27} H_{44} O_{13} plus H_{20}, was obtained by Kiliani in needles grouped into wart-like bodies. These dissolve sparingly in cold water, and do not separate from a hot solution when cooled. Its irritative effects closely resemble those of saponin.

The digitonin of Van Renterghem is a white amorphous powder, dissolving readily in water, or in alcohol, and is precipitated by tannic acid. He gives it the formula of C_{31} H_{52} O_{17}, as does Schmiedeberg.

The resemblance of digitonin to saponin is so close that Van Renterghem avails himself of studies of the latter, for want of accurate observations on digitonin. Hypodermic injections of saponin gr. 1½ caused œdema and erysipelatous inflammation at the point of entrance. Soon after there were grave headache of the right side, intense pains in the eye and the extremities, with bodily and psychic depression. The temperature fell notably and it was only after five hours of very serious indisposition that the experimentor escaped an imminent death.

Taken by the mouth, it excites cough and exaggerated secretion of the laryngeal and bronchial mucosa for many hours. Doses of gr. 1½ to 3 do not cause toxic symptoms, nor do they augment the secretions of the skin and kidneys. Applied to wounds or mucous surfaces it causes lively pains and plastic exudations. Injections in animals cause paralysis of motor and sensory nerves around the site of the injections, extending towards the cord.

Carried immediately to the cord, saponin after preliminary tetanic symptoms, causes central paralysis, extending to the peripheral nerves. The action extends to the whole muscular system, striated, cardiac, and the smooth fibers of the gastrointestinal tube. Entering the circulation it exerts a triple action upon the

heart; annihilating the excitability of the muscular tissue, paralyzing the peripheric fibers of the pneumogastric and the inhibitory centers, as well as the accelerator nervous fibers of the sympathetic. By these the heart-beats lose their energy, the circulatory center is paralyzed, arrested in diastole.

With warm blooded animals these phenomena are followed or accompanied by a fall in the vascular pressure, of the animal heat, and of the respiration.

The administration of digitalin can prevent the death. Digitonin is less energetic than saponin.

Toxiresin and digitaliresin, decomposition products, closely resemble picrotoxin in their effects. By exciting the pneumogastric and the vasomotor centers, they occasion weakening of the pulse and elevation of the arterial pressure.

Digitonin forms half the mixed glucosides from the seed, but is less abundant in the leaves. It enters into the composition of Germanic digitalin. The yield is from 4 to 5 per cent.

Digitalein, C_{22} H_{34} O_9, forms small round granules, very soluble in water and in alcohol, insoluble in ether, chloroform or benzol.

The taste is very bitter and sharp. It is precipitated by tannic acid. Administered hypodermically, it causes no irritation.

Schmiedeberg's digitalein is a yellowish-white amorphous powder, intensely bitter. Merck gives the dose as gr. 1-64 to 1-32, two to four times a day.

Digitoxin, C_{21} H_{32} O_7, occurs in needles of nacre luster, insoluble in water, soluble in chloroform, or in hot alcohol. When administered hypodermically it causes phlegmonous inflammation. The effects of a medicinal dose last 8 to 10 days. Doses of gr. 1-33 endanger life.

It is not precipitated by tannic acid.

The emetocathartic effects follow its topical application as well as its administration by the stomach.

Merck gives the dose as gr. 1-250 to 1-125, three times a day, with 3 m. chloroform, 60 m. alcohol and 1½ oz. water. Maximum daily dose gr. 1-32.

The yield of digitoxin is about 0.4 per cent. It is very slow in developing its action, and may be reprecipitated in the alimentary canal and reabsorbed en masse later, thus throwing the whole effect on the system at once.

Nativelle's crystallized digitalin consists of one-third pure

digitalin and two-thirds digitin. The "pure" digitalin is a mixture of digitalin, digitoxin and toxiresin.

Nativelle's amorphous digitalin consists of digitalein.

Homolle and Quevenne's amorphous digitalin is composed principally of digitalin, with the formula of C_5 H_8 O_2.

Digitalin Germanic of Finzelberg: A mixture of digitalin and digitalein.

Pure digitalin Germanic: This is principally digitalein.

Schmiedeberg states that digitoxin, digitalin and digitalein exert an absolutely analogous action; the differences being simply those due to their diverse solubility, and energy of action. Digitoxin is from six to ten times stronger than the others.

The cumulative action of digitalis has been much discussed. Gubler distinguishes between the accumulation of doses and that of effects. Given in pills or powders, their want of solubility or unfavorable conditions of absorption may cause an accumulation of the doses in the alimentary tube. When the conditions here favor solution and absorption, the whole collection may be poured into the blood at once.

The accumulation of action depends on the elimination, which may cause the retention in the body of part or all the drug, until enough has accumulated to cause toxic effects.

The habitual use of a remedy also entails a gradual diminution of its effects, as the impressibility of the body diminishes or the antagonistic forces increase.

The first of these difficulties, accumulation of doses, cannot be avoided as long as the physician uses galenic preparations, as he cannot tell whether he has simply given a weak dose, of old leaves perhaps, or that the dose has not been utilized. These perils are avoided by the use of the active principles. And if all the various so-called digitalins were retired but one, this would quickly be done. But since digitoxin dominates in the preparation of Nativelle, digitalin in Homolle and Quevenne's, and digitalein in the Germanic, any one of these is preferable to the crude digitalis, bearing in mind the difference in strength and solubility of the three principles mentioned.

Koppe found that two milligrams (gr. 1-33) of digitoxin, a single dose, given an adult man, caused toxic symptoms very violent and persisting many days. Megevand took one-third of a milligram (gr. 1-200) of Nativelle's digitalin once a day for six consecutive days. The pulse began to slow on the second day, fell more

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rapidly each day, the lowest point being reached on the seventh day, when he felt nausea followed by vomiting and headache, intense and persisting till the following day. The pulse had fallen to 48, and it was not till the 12th day, six days after ceasing the use of the drug, that it returned to its normal rate, 67 to 70.

The insolubility of digitoxin in water furnishes a sufficient reason for discarding it.

Megevand took for seven consecutive days a daily dose of four milligrams (gr. 1-16) of Homolle and Quevenne's digitalin. On the fourth day came the first fall in the pulse, of five beats; on the sixth and fifth it fell to 55; and it was four days after the cessation of the drug that the pulse returned to its normal rate of 67. Toxic symptoms due to the accumulation of this digitalin were observed by Homolle, as nausea, headache and delirium. These disappeared after 24 hours.

Chemically pure digitalin, and Homolle and Quevenne's are but slightly soluble in water, and present, after doses not too strong and repeated for some days, commencing intoxication. They are therefore not the best agents for use. Goerz used chemically pure digitalein; taking for 10 days granules containing a milligram (gr. 1-67), beginning with one granule and adding one each day up to five. The pulse fell from 54 to 46, becoming fuller, stronger, but more irritable; that is, after slight exercise it rose to 128. He felt slight headache, anorexia, great weakness and epigastric pressure.

Van Renterghem took for 15 days eight milligrams of digitalin Germanic (digitalein), in two equal doses. No dyspeptic symptoms nor slowing of the pulse were noted. But the same preparation, given to a patient with chronic pneumonia while affected by a hemoptysis without fever, brought the pulse from 96 to 62, and stopped the bleeding. The remedy was given in water, a milligram (gr. 1-67) every half-hour.

In a case of ascites Van Renterghem obtained diuresis and cured the patient, without lessening the pulse-rate. In a galloping phthisis the use of Germanic digitalin, 20 milligrams (gr. ⅓) a day, with aconitine, veratrine, strychnine and quinine, caused on the 14th day aching about the eyes and anorexia; the digitalin was stopped and the veratrine doubled, when the headache and dyspeptic symptoms subsided. He gives the preference to this agent, as perfectly soluble in water and presenting the least danger of cumulation.

The organism easily accustoms itself to digitalin. Given daily in moderate doses it may be continued for years without toxic ef-

fects, but produces its physiologic action on the cardiac muscle and prevents fatty degeneration.

Digitalin is eliminated in part by the kidneys (Dragendorff).

Huesemann calls attention to the danger of accumulation in cases of ascites with chronic nephritis as the renal elimination is here defective.

Synergists.—Many agents are ranked among the cardiac tonics. Digitalin, antiarin, helleborein, euonymin, and thenetin, crystallizable glucosides; scillain, adonidin, oleandrin, non-crystallizable glucosides, little soluble in water; digitalein, nerein, apocynein, convallamarin, amorphous glucosides, very soluble in water; digitoxin, strophanthin, apocynin, not glucosides, partly crystallizable; tanghinin, neriodorin, neriodorein, upas, whose nature has not yet been studied sufficiently; erythrophloeine, an alkaloid combining the effects of digitalin and of picrotoxin; phrynin, derived from some kinds of frogs, affecting the heart like digitalin and causing local irritation; caffeine, which regulates the heart, augments its energy, slows the pulse and raises the arterial pressure.

Among the auxiliaries are, as antipyretics, veratrine, aconitine, quinine; vascular tonics, arsenous acid, iron, ergotin, strychnine; as diuretics, aconitine, neutral alkaline salts, turpentine; as cerebral calmants, strychnine, aconitine, hyoscyamine, morphine.

It is usually advisable to give digitalin when indicated, up to the desirable effect; when this begins to fail, add one of the other cardiac tonics, and later another, instead of increasing the dose of digitalin.

Antagonists.—Atropine and chloral paralyze the nerve-ends of the pneumogastric in the heart, and prevent the slowing of the pulse, without affecting the increase in the arterial pressure.

Koehler says saponin antagonizes digitalin, and therefore digitonin does so also. The stoppage of the heart in systole due to digitalin is obviated by saponin, which neutralizes the excitation of the inhibitory nerves; while digitalin in turn by exciting strongly the cardiac muscle suppresses or abolishes the paralysis of saponin.

If too large a dose of digitalin has been given, the stomach should be emptied by emetics and the pump or lavage, then tannic acid given in repeated doses to render the poison insoluble; when absorbed, measures are to be taken to favor elimination, saline purgatives and diuretics. Stimulants should be given internally—camphor—and rubefacients applied to the skin with rubbing, and heat applied. Coffee and tea are contraindicated.

The danger in digitalis poisoning may last for several days, during which a sudden movement or even psychic excitement may occasion sudden stoppage of the heart. Absolute quiet must therefore be enjoined, even after improvement has set in and a subjective feeling of well-being is present. Anything calculated to occasion vomiting is to be avoided, such as free drinking.

But poisoning is usually due to single large doses. The cumulative effects are limited to gastric irritation, headache, stupor; preceded by nausea, supraorbital tension, weak feelings in the epigastrium, photopsia, insomnia and tinnitus.

These subside when the medicine is discontinued.

Therapeutics.—The therapeutics of digitalin is to be deduced from its action, in strengthening the heart, contracting the blood-vessels, and increasing the excretion of urine. It is of the utmost importance that the physician using this potent drug shall know exactly how to secure the greatest benefit from it; and just when the maximum has been attained. The indication of exact dosage is to be taken from the pulse, for the useful action is manifested there rather than in the heart itself. It is obvious that digitalin can add no real strength directly to a weak heart. There is no nitrogenous element in the glucoside that will act as a heart food. The benefit directly obtained from its action on the heart is therefore in the nature of stimulation—the whip that urges on the tired horse a little farther when he begins to flag. And there is this further disadvantage, that by contracting the coronary arteries the nutrition of the heart is lessened, and the supervention of fatty degeneration hastened. But if the effect of digitalin on the arteries is taken as the measure of its activity we have a very different story to tell.

Take a membranous tube, and try to force water through it; the force will be expended in dilating the relaxed walls of the tube, and you may increase the force until you burst the tube, and yet you cannot force the water through it. But if you take a tin tube of equal length you can with ease force the water through. There is no force expended in dilating the walls. Now if just enough digitalin is given to impart normal tone to the relaxed blood-vessels, a great obstacle will be removed from the heart, and its work will be thus made easier. By this the work the organ must do is reduced so as to come within the limits of its strength, and with this physiologic rest there will be an improvement of the heart's nutrition. In this way, and in no other, digitalin may be made curative to maladies of the heart with loss of power. And if thus given the

drug may be continued for very long periods without injury, but with distinct benefit. But if the doses be increased till the vessels are abnormally contracted, the heart's work will be increased and exhaustion hastened.

The only other means by which a weak or imperfect heart may be made to perform its vital functions indefinitely, is by reducing its work to the limit of its strength; and this demands the lessening of the bulk of the blood by enforcing the dry diet. If the quantity of fluids taken into the body daily is less than the quantity cast out by the emunctories, the weight falls, mainly at the expense of the fluids of the body—the blood. If one pound of useless water is taken from the blood, the heart is materially relieved in its work; and as the same quantity of nutritive material is contained in the concentrated blood, nutrition does not suffer.

From the foregoing considerations it is evident that digitalin is contraindicated in any cardiac affection in which the arterial tension is not below normal. When the tension is above normal, as in atheroma or in cirrhotic nephritis, there is danger in this drug. Fothergill warned against digitalis in aortic stenosis, and this is a wise caution when there is atrophy; but when hypertrophy has ensued and compensation is failing, we can obtain from digitalin the same benefit as in mitral affections.

Gubler considers digitalin contraindicated in aneurisms, in cerebral congestions and apoplexies. During the period of compensatory hypertrophy in valvular disease digitalin is not needed and its use would be dangerous; but when compensation begins to fail the utility of this drug is well shown. It is equally applicable to this condition of failing compensation, whether following mitral stenosis or insufficiency, or mixed forms, or in aortic insufficiency; though there it has been considered of doubtful utility. Gubler termed it useless here; while others have called attention to the danger of prolonging the diastole when the ventricle is already partly filled with the regurgitant blood. But even here, if the vessels need toning, there will be distinct benefit from digitalin, though it should be given in careful dosage. But advanced degeneration of the heart-substance as well as hypertrophy, are distinct contraindications. Rupture of the feeble heart-wall may result from the powerful contraction of the remaining muscular fibers.

The effects are less marked in affections of the tricuspid, since in adults they occur as a late effect of mitral disease.

The above view of the place of digitalin receives confirmation

from clinical observations such as these: Van Renterghem says that the remedy is specially marvelous if the vascular tension is notably low. Traube and Fraenkel remark that the general symptoms improve under its use, even when no modification is evident in the frequency or regularity of the pulse. Binz does not consider impossible the claim that cases of fatty degeneration have been actually cured by prolonged use of digitalin and iron, even when complicated with dropsy and albuminuria. He attributes the effect to the improvement of cardiac nutrition, comparing the effects with those of exercise, electricity and massage on the general muscular system.

Leyden advised digitalin in maladies of the right heart without valvular imperfections but with weakness.

Huesemann says that in paralysis of the left heart digitalin can arrest at the outset the pulmonary œdema.

In strictly functional disorders it is necessary to associate other remedies with digitalin.

Binz thus summarizes the indications for digitalin in cardiac maladies: Pulse agitated, palpitant; stases in the lesser circulation, causing oppression, bronchial catarrh, cardiac asthma; arteries small and empty, veins overfull, skin cyanotic, sensation of cold, nutrition impaired, serous transudations in the subcutaneous tissues of the lower extremities and in the peritoneum; urine secretion much diminished.

The second use of digitalin is as a remedy in fevers and inflammations.

With aconitine it forms the basis of the alkalometric treatment of fever, their use being based on the following reasoning: The first stage of any inflammation is hyperemia, the presence in the affected tissues of an abnormal amount of blood. There is not an immediate increase in the body's supply of blood, but an abnormal distribution of that previously existing. It follows therefore that the presence of too much blood in one part necessitates the admission that there is too little blood somewhere else. The excess of blood is at first to be found in the vessels, and the capillaries are dilated and engorged. But this must mean that the vasomotor nerves governing the caliber of these vessels are paretic, else they would not permit the entrance of too much blood, and the dilation. And as the vessels elsewhere have too little blood, they must be in a spastic state, being unduly contracted. Hence, for every vasomotor paresis in an inflamed area there is a vasomotor spasm elsewhere:

and these two conditions exactly balance each other. The beginnings of an inflammation may be opposed either by stimulating the paretic vasomotors to contraction, or by relaxing the spastic vasomotors to allow the blood to flow back into the contracted vessels in normal quantity. All direct treatment of fevers is based on one or the other of these two therapeutic principles, and the history of medicine shows a constant oscillation between them—as was once said, "we bleed down to the brandy point, and then brandy up to the bleeding point."

It remained for Burggræve to demonstrate the previously unsuspected fact, that both these processes could be induced in the same body at the same time; and that the paretic cells would take up the needed doses of stimulants, and the spastic cells what they needed of sedative agents, as each cell in the body takes from the common supply of blood just what food it requires and passes the rest by. Hence, there is no real antagonism between such tensors as digitalin and relaxants as aconitine, but when they are administered at the same time each does its work where it is needed. Taking these as the basis, we find that some cases show an abnormal weakness of the heart and of the general vitality; and this induced Burggræve to add the powerful vital incitant strychnine arsenate, making a triad whose efficiency in all asthenic types of fever leaves little to be desired. And as many cases show an excited, overacting heart, and a deficiency in the elimination of toxins from the body, Abbott was inspired to add that great sedative and unlocker of elimination veratrine, making a second triad for the sthenic forms of inflammation.

On these two combinations is based the alkalometric treatment of fevers. By their use the temperature is held within safe limits, the excessive expenditure of vital force is checked, the excretion of waste and imperfectly elaborated products is facilitated, which if retained in the body would increase the fever; while nutrition is favored, inanition prevented, and the patient is put in a state to better resist the onslaughts of disease.

The writer believes this method compares favorably in intelligibility and is far superior in results over the ordinary methods of veering aimlessly between alcohol, quinine, coal tars, strychnine, digitalis, baths, and the procession of sedatives and stimulants that succeed each other kaleidoscopically.

The gentle but persistent action of these alkaloids, an action exerted upon the innate causes of the derangement instead of simply

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smothering the symptoms of their effects, commends itself to any physician who will sit down and observe what follows their administration.

Liebermeister found digitalis useless or even injurious during the febrile period, but when the fever had fallen and the pulse still remained fast, this agent acted admirably, in moderating the cardiac movements. Binz says that as an antipyretic digitalis can do no good when in fever the blood-pressure is normal or above normal; but if it is below normal at the time of the administration of this drug it will show the same benefits as in the corresponding state when due to heart-disease. Van Renterghem calls attention to its action as a sedative to the vascular erethism. By contracting the vessels it lessens oxygenation in the tissues, and thus prevents heat production. The principal indications for digitalin are found in acute pneumonias, pleurisies, endo- and pericardites; where it lowers fever, frees the pulmonary circulation and limits the spread of the inflammation. Associated with the remedies mentioned, it is of real service in typhoid fever, the eruptive fevers, acute continued fevers and hectic. It is of value also in acute ocular inflammations, cystitis, rheumatism; in a word, in all maladies characterized by a rise in temperature, digitalin and its associates are of premier importance.

To estimate properly the effects of digitalin as a diuretic we must remember three influences that are exerted on the excretion of urine: The renal circulation, the composition of the blood, and the nervous influence. Digitalin acts principally by modifying the renal circulation. It is in passive renal congestions accompanying organic heart-diseases and in blood stases from functional circulatory affections that it finds its field. The general acceleration of the circulation enables the renal veins to better discharge their contents. Gubler says renal congestions are found in simple nephrites, those dependent on diatheses, such as gout, uricacidemia, in the decline of fevers, and analogous cases. Digitalin is diuretic by increasing the renal vascular pressure, not by stimulating the excretory apparatus. It is useless in hepatic dropsies, the cancerous cachexia, etc. The dialysis-stimulants, the saline diuretics, aid the action of digitalin.

Digitalin has a certain influence in calming excited states of the brain. Mason Cox valued it very highly in mania. I have succeeded by its use in quieting noisy maniacs when all other means failed. Fothergill advised this remedy especially in the mania of

drunkards, where it relieves the cerebral anemia. Huss and Gunsburg recommended it in delirium tremens, where it replaced opiates some years ago. The tincture was given in doses up to two ounces. Certainly digitalis is preferable to opium, but the eliminants have replaced both. Nevertheless there are cases in which this remedy is indicated and very beneficial. The weak and rapid heart calling for it is sometimes seen in these subjects.

Huesemann advised digitalin in delirium with inflammation and fever; such as the pneumonias of drunkards. But Gubler attributed the benefit to its effect on the hyperemia or the fever present. And as in epilepsy the crisis is always accompanied by an afflux of blood to the nerve centers, we can with benefit direct against it digitalin, as we do other remedies such as the bromides.

Burggræve recommended to oppose to the delirium of drunkards, always asthenic, digitalin, aconitine and strychnine; stimulating the heart, vasomotors and nerve centers. The doses of each are regulated by the case.

As a remedy for hemorrhages, digitalin is too slow for emergencies; but the writer has had this curious experience: In a number of postpartum hemorrhages, he has given ergot until the flow was reduced to a small one—mere oozing—and beyond this ergot would not go, no matter how large the doses. Then if digitalin were given, the remaining hemorrhage was stopped entirely.

Dosage.—The subcutaneous method is not suited to digitalin, because even using the soluble digitalein it occasions some irritation, and because a remedy demanding such nicety as to dosage requires too many punctures when thus employed. To control hemorrhages, to combat depression resulting from snake bites or mushroom poisoning, digitalin may be thus given as an adjuvant to or substitute for strychnine or atropine.

Merck gives the dose of digitalin "German" as gr. 1-64 to 1-32, four times a day; maximum daily dose gr. ⅓.

Van Renterghem advises for infants two years old a granule, gr. 1-67, every half-hour; for older patients two or three granules thus repeated. Especially should the remedy be watched when given to a patient for the first time, and in nephritis. Renal impermeability is a contraindication, as it is of so many other remedies. The space of a half-hour between doses allows enough time for absorption; less than this would not.

How soon does digitalis show its effects? Traube says, in 24 to 46 hours; Rabuteau puts the time at 10 to 12 hours for the digitalin

of Homolle and Quevenne; while Van Renterghem claims that the Germanic digitalin displays its physiologic effect in 4 to 6 hours. If gastric irritation is manifested the remedy should be suspended until all such symptoms have disappeared. As soon as the pulse slows, lessen the frequency of the doses, and stop altogether if the fall continues or when the rate approaches the normal. In a young and healthy man this is about 66 when lying down, 71 when sitting and 81 when standing.

How long may digitalin be given with benefit? Beates has administered the Germanic digitalin (digitalein) to patients with organic affections of the heart, in doses of gr. ¼ thrice a day, for years, without harm or wearing out of the remedy.

Some observers have advised that a single dose be given and only repeated at very long intervals—one says six weeks. The idea is that as given to compensate for the leakage of the valves, we should wait until there has been an accumulation of surplus blood in the ventricle. But this is obviously *a priori* reasoning; and as a leakage of a single drop would in an hour reach the quantity of nearly half a pint, there is a fallacy present. If the mechanical theory involved in the "dry diet" be adopted, it will be found that the doses of digitalin may be gradually diminished, as less will be needed to maintain the circulation.

Liebreich mentions as an indication for stopping digitalis the occurrence of a pulse in pairs, with a longer interval after each two beats.

Paroxysmal tachycardia also seems to be a contraindication. The dilation is apt to indicate disease of the heart-walls and digitalin may then do great harm. It is specially dangerous in cases with fetal pulse (Liebreich).

In exophthalmic goiter digitalis does well, if given carefully. In dropsies with emphysema digitalin is not to be used as long as hypertrophy of the heart endures.

In hemoptysis of phthisis, digitalin is most valuable when the heart is excited and irregular rather than overly powerful.

The enormous doses of digitalis given by Petrescu for pneumonia are now explained by the weakness of the drug as found in Roumania.

Many practicians believe that digitalis has a specific effect in septic maladies, combating sepsis itself. This has no foundation outside of clinical trials, and not much there.

DIOSCOREIN.

Standard granule—Gr. 1-6, gm. .01.

Dioscorein is a concentration from the wild yam, Dioscorea vittata. Its virtues are attributed to a resin, insoluble in water but soluble in alcohol.

King simply says that dioscorea is a specific for bilious colic, giving prompt and permanent relief in the most severe cases. He gave half a pint of the decoction every half-hour, or five drops of specific dioscorea every five minutes. Webster extends its use to every form of colic, other painful abdominal neuroses, and all gastrointestinal irritations. If it does not relieve in an hour discontinue the remedy. It allays the pain of biliary calculi when given with gelsemium. It has proved useful in cholera morbus with cramps, neuralgias, nervous irritability with pain or spasms, hiccough, obstinate and painful vomiting, gastralgia, and in a case of asthma (King).

Felter and Lloyd say the action appears to be especially upon enfeebled and irritable mucous membranes, with spasm of their muscular fibers; hence its use in colics, tenesmus of dysentery, spasmodic dysmenorrhea, and gastric spasm with pain and vomiting. It has been advised in indigestion with hepatic derangement, chronic hepatic congestion, chronic gastritis of drunkards, after-pains, etc.

Specific Indications.—Bilious and other colics with spasmodic contractions; yellow skin and conjunctivæ, nausea, colicky abdominal pains, coated tongue, deranged stomach; frequent, small, flatulent stools; colic with tenderness, sharp abdominal pain made worse on motion.

Ellingwood thinks it especially effective in malarial cases, and much more certain in spasm and pain of the bowels, though useful in all spasmodic pains. He advises it in all uterine pains and in ovarian neuralgia.

Shoemaker says dioscorein is expectorant but derives its chief value from its effect on the liver. It is emetic in large doses. It quickly relieves pain and spasm of gall-stones if not too large to pass, and is useful to reduce irritation after the passage of the stone.

Hepatic indigestion and its consequences are quickly relieved by dioscorein. Hepatic cirrhosis seems to be delayed by its use, and it increases the analgesic effect of morphine in hepatic carcinoma.

The dose of dioscorein in spasmodic and other painful affections

is gr. 1-6 to 1-2 every five minutes till relief, best dissolved in a little alcohol or hot water. In chronic maladies give a grain one to four times a day, in granules to secure slow absorption and continuous action.

DUBOISINE SULPHATE.

Standard granule—Gr. 1-500, gm. .000125.

While the other alkaloids of this group are derived from solanaceous annuals, this comes from a tree, native to Australia. It is also found in minute quantities in belladonna, stramonium and hyoscyamus. Duboisine is isomeric with atropine and hyoscyamine; according to Nothnagel identical with the latter and according to Merck identical with both. Foster says the mydriatic effect is more quickly manifested than that of atropine and does not last as long; that it does not cause delirium like atropine, nor does it disturb the respiration. Cushing thinks the plant and the alkaloid contain at times hyoscine or hyoscyamine.

Duboisine has been recommended in exophthalmic goiter to allay the circulatory disturbance, but it has no control over the course of the malady.

Dr. Cate published an interesting account of its application in a case of Laloneurosis, which will be found in American Alkalometry, Vol. I, page 434.

If there are really differences in these rarer members of the atropine group, they are yet to be demonstrated. According to Merck there are but two alkaloids in this group, atropine and hyoscine, the others being merely mixtures of these two, and modifications that do not materially affect their therapeutic effects. It seems that a fruitful field of experiment awaits the investigator as to the effects of varying proportions of these two alkaloids when administered together.

Nothnagel gives the dose of duboisine as gr. 1-80 to 1-30, and yet declares it is less than that of atropine. The standard granules of duboisine contain gr. 1-5000, and this may be repeated every ten minutes until the atropine symptoms appear—dryness of the mouth first, then flushed skin, dilated pupils, etc.

In therapeutic applications, effects, toxic and remedial, antidotes, etc., it closely resembles atropine.

ECHINACEA

The best preparation of Echinacea angustifolia as yet available is the extract.

Lloyd terms echinacea a remedy of depuration of the body fluids. Its extraordinary powers combine those included under the terms antiseptic, antifermentive and antizymotic. It controls the disturbed balance of the fluids resulting in such tissue changes as are presented by boils, carbuncles, abscesses, cellular glandular inflammations; serpent or insect venom, malignant diphtheria, cerebrospinal meningitis, puerperal and other septicemias; "bad blood," asthenia, adynamia, the tendency to malignancy. Septic wounds are treated with this agent. In cerebrospinal meningitis Webster found it best for cases with weak pulse not fast, little fever, cold extremities, headache, peculiar flushing of face down to neck, dizziness and profound prostration. As a stimulant to the capillary circulation he found no equal to echinacea. It endows these vessels with recuperative force. Lloyd doubts the value of this agent in malignant diphtheria, having failed with it. In non-malignant cases it appeared to expedite recovery. It gave him better success in tonsilitis with dirty, ulcerative surfaces. The form of quinsy known in the west as black tongue has responded to echinacea. It aids in the cure of respiratory catarrhs, with offensive ulceration, dark color and debility. It has overcome the fetor of pulmonary gangrene and given early has prevented that catastrophe. Shelley reported a typhoid pneumonia with jet black tongue which improved on echinacea.

Lloyd has used it in fermentative dyspepsia, with bad breath and gastric pain, worse on eating; in duodenal catarrh, intestinal indigestion with pain and debility; ulcerative stomatitis, nursing sore mouth, diarrhea, dysentery, cholera morbus and infantum, typhlitis and perityphlitis; eruptive fevers, especially the catarrhal phases and angina of scarlet fever. It has done best in typhoid and typho-malarial fevers, and in sympathetic fevers from rheumatism or sepsis. King found it fail in every case of ague. Others find it useful in asthenic malaria. It occasionally aids in influenza, and assists convalescence. Puerperal septicemia yields to echinacea but curetting must be done if indicated. The succeeding debility is relieved by echinacea. Hayes commends it in mountain fever.

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fauces; removing the odor promptly; cancerous cachexia; tubercular abscesses, gangrene, empyema with pulmonary gangrene, appendicitis (Farnum); phlegmonous swellings, old sores, erysipelas with sloughing, phagedena, dissecting and surgical wounds, phlegmasia dolens, dermatitis venenata, and pus cavities.

As a local remedy Lloyd speaks of echinacea for malignant carbuncle, painful mammitis, gonorrhea, syphilis, impotence, purulent salpingitis, offensive leucorrhea, erythematous and erysipelatous vulvitis (Webster), eczema with asthenia and general depravity (physical, we suppose).

Post-scarlatinal dropsy has been reported as cured by echafolta: also as preventing hydrophobia. It has been recommended for smallpox, as relieving the symptoms of phthisis, especially the cough of stone-cutters' phthisis; and Lloyd suggests that it may favorably impress the tubercular diathesis.

Specific Indications.—To correct fluid depravation, bad blood, tendency to sepsis and malignancy, as in gangrene, sloughing and phagedenic ulcerations, carbuncles, boils and various forms of septicemia; foul discharges with weakness and emaciation; deepened, bluish or purplish color of skin or mucosa, with low inflammation; dirty-brownish tongue, jet black tongue, multiple cellular abscesses semiactive with marked asthenia; especial importance in typhoid, septicemia and other adynamic fevers; malignant carbuncle, pulmonary gangrene, cerebrospinal meningitis and pyosalpinx; locally to annul pain and correct fetor of open cancers.

Ellingwood says that when tincture of echinacea is taken into the mouth it causes tingling, somewhat recalling that of aconite, which remains for half an hour. Swallowed undiluted it causes a sense of constriction, promotes the flow of saliva, followed by diaphoresis and if repeated by diuresis. The functions of all the glands seem to be stimulated. The appetite and digestion improve, the bowels act better, absorption, assimilation and nutrition are enhanced. It encourages secretion and excretion, preventing further autointoxication and correcting what has occurred. It stimulates tissue waste more than any other remedy known. Sallow, pallid and dingy skins become rosy. Anemias improve and gain tone. It is the remedy for blood poisoning. The field covers acute autoinfection, slow progressive blood taint, imperfections of elimination and germic affections. The special indication is the tendency to gangrene and sloughing of soft tissues, throat dark and full, tongue full with dirty dark brown or black coat, in all cases where there is sepsis or

zymosis. As an intestinal antiseptic he places echinacea in the first rank. In typhoid fever treated by it the extreme limit of duration is 21 days and some report a week as the limit. In uremic poisoning it will supersede all other single remedies. In cholera infantum it is specially useful when nervous phenomena are present.

Dr. Meyer used echinacea for hemorrhoids, injecting it into the rectum three times a day. He records 613 cases of rattlesnake bite successfully treated by this agent.

Dr. F. M. Friend testifies to the value of echinacea in all cases of sepsis. He employed it in a desperate case of scarlet fever with success.

All accounts agree that there is little if any effect from this drug when given to a person in health. Its effects are only manifested when there is an enemy to encounter. And if it is useless, there are a good many capable observers who have been badly mistaken.

The dose of the best preparation, Lloyd's echafolta, is from two to ten drops every two hours.

ELATERIUM.

Standard granule—Gr. 1-6, gm. .01.

This agent is the active principle of the Momordica elaterium, one of the gourd family to which we owe so many valuable medicines. In July the proportion of elaterin is about 0.4 per cent, and in August when the plant matures it rises to 0.7 per cent. In September it vanishes completely; a circumstance which, as the *Chemist and Druggist* says of a similar variability in hydrastis, does not interest the manufacturers of galenic preparations, but does those who extract alkaloids. Possibly it may interest the physician.

Elaterin is insoluble in water, slightly soluble in ether, readily in boiling alcohol and in alkalies. It requires the presence of bile to develop its activity. It is the type of the drastic hydragog cathartics, acting powerfully on the bowels an hour after it is taken, even more promptly than croton oil. The place of elaterin is in threatened uremia or apoplexy, cerebral hyperemia, when it is essential to remove a portion of the toxic material from the blood to prevent convulsions, or to reduce the cerebral vascular tension as rapidly as possible. Here nothing but venesection equals the speedy action of elaterin. These emergencies come to the physician rarely, but when they do come the danger is imminent and haste is imperative. Hence

the *vade mecum* case should always contain a vial of elaterin granules, though but few in number.

The standard granules contain gr. 1-6, and of these one should be given every five minutes, or five at once, if possible with an alkali like ammonia to hasten solution and action. Overdoses call for stimulants and anodynes, hot whisky, hot enemas, camphor and capsicin, with atropine in full doses hypodermically.

EMETINE.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Among the eccentricities encountered by the physician who adheres to the use of ipecacuanha is the uncertain derivation of his supply. Four plants contribute to the ipecac of the market: Cephaelis ipecacuanha, Psychotria S. Ronabea emetica, Richardsonia scabra St. Hilaire, Ionodium ipecacuanha Ventenat. Of these the first three belong to the family of Rubiaceæ, the other to the Violaceæ. The first has about four times the activity of the others.

As early as 1817 Pelletier and Magendie obtained emetin, which they recommended in place of the crude drug, being 100 times as active, and devoid of disagreeable taste and odor. The galenic preparations of ipecacuanha are notoriously unstable and variable in strength, while emetine is stable and uniform in strength, and if the irritant cephaeline is excluded, is far less liable to cause emesis in doses that still fully afford the valuable action on the digestive apparatus to which the principal effect is due.

Emetine does not change when exposed to the air. It is soluble in 1,000 parts of cold water, more readily in hot water, and quite easily in alcohol or in ether. It is bitter. It dissolves easily in acids forming acid salts, and is precipitated by vegetable astringents.

The percentage of emetine in the crude drug is so variable that no accurate dosage can be based thereon. Pelletier obtained only 0.78 per cent, while Zenoffsky secured 3.8 per cent. But Rabuteau declares that the ringed bark contains 16 per cent, the striated 9 per cent, and the wavy 3 to 4 per cent. His method of extraction is as follows: The ipecac is mixed with a little water, potassium or sodium nitrate added, the emetine precipitates as a nitrate, in a mass; this is washed, dissolved in alcohol, decomposed by milk of lime; the mixture dried in a water bath, powdered and when digested with ether gives up to it all its alkaloid. Evaporating the ether there remains a yellowish substance, which is treated with sulphuric

acid. Emetine alone dissolves in the solution, and when dilute ammonia is added the alkaloid is deposited as a white precipitate, which is then washed with cold distilled water. Emetine thus obtained is pure.

Physiologic Action.—Magendie found that half a grain of impure emetine caused vomiting in dogs or cats, often followed by prolonged sleep. Ten grains caused vomiting in dogs, after which the animals became drowsy; but instead of returning to health as when small doses of emetine were given, the animals died within 24 hours. Death was due to a profound inflammation of the lungs and the intestinal mucosa from the cardia to the anus. The same results ensued when emetine was injected into the jugular vein or absorbed from any part of the body.

Two grains of emetine taken fasting by a well man caused prolonged vomiting followed by a pronounced disposition to sleep. One-fourth of a grain sufficed to produce vomiting. Given to a sick man it caused vomiting and stools as with a well man, influencing in a happy manner catarrhal affections, especially when chronic. Huesemann found that emetine produced a cathartic effect not obtainable from ipecac, in which the crude vegetable matters hinder this action.

Applied to the skin in ointment emetine causes after some time a sense of burning, forms pustules with a red areola, and continual absence of appetite. If continued long enough it causes ulceration of the skin to which it is applied. Introduced in the eye it causes inflammation of the conjunctiva and cornea; in the nose incessant sneezing; in the air passages cough, swelling of the mucosa and respiratory troubles (Buchheim). A concentrated alcoholic solution left in contact with the tongue produces a sense of warmth quite different from that caused by aconitine or by veratrine. Injected under the skin it causes local inflammation which renders this mode of administration unavailable. But if thus used it occasions vomiting as when given by the stomach.

Emetine is eliminated by the gastric mucosa and by the kidneys (Dragendorff). The local action on the gastric ends of the pneumogastric causes a secondary excitation of the vomitive center. For Pecholier and d'Ornellas found that the emetic action was suppressed by section of the vagus.

The nausea is more decided when the drug is introduced through the stomach.

A very light dose—gr. 1-134 to 1-67—by the mouth, causes a

slight sense of warmth in the stomach, like that following a small dose of arsenic. A larger dose repeated, gr. 1-30 to 1-12, causes yawning nausea, free salivation and finally vomiting. Meanwhile the bronchial and intestinal mucous secretions are increased. Still larger doses cause prompt vomiting, followed, as are moderate doses if repeated, by liquid stools. Collapse and death may result if the doses are large enough. Rutherford introduced ipecac directly into the duodenum of dogs and observed an increase in the secretion of bile and of the intestinal mucus. The pulse is accelerated by an emetic dose up to the occurrence of vomiting; it then falls even below normal. If vomiting does not occur the heart action is retarded. Toxic doses can cause death by cardiac paralysis. The effect on the respiration is quite similar.

Emetine has no direct influence on the central nervous system. It causes muscular depression. During the nausea the cutaneous glands are active. Therapeutic doses have no appreciable effect on the urinary secretion but toxic doses may cause albuminuria.

Emetine is said to occasionally cause hyperemia or œdema of the lungs; to dissolve the red cells when injected intravenously; and to rarely cause urticaria when taken by the mouth. Shoemaker is quite positive as to its cholagog action. At any rate, when given in a single full dose at bedtime and retained, the evacuations next morning are those usually denominated bilious, and the effects are such as are attributed to clearing out of this organ. In fact, it has seemed to the writer that not even calomel so completely unloads the liver.

Van Renterghem says that except violine emetine has no *synergist.* All emetics are auxiliaries. Pilocarpine sometimes causes vomiting, but it is ranked with emetine rather for its action in increasing the secretion of the bronchial mucosa.

The narcotics retard the nauseant action, as well as the purgative; while the aromatics and stimulants do this and also combat the general depression and tendency to collapse. Cocaine as a local anesthetic, and the strychnine group as incitants of the nervous system, prevent or retard the nauseant effects of emetine, but act as auxiliaries when one desires the other effects without the nausea.

The only *antidote* is tannic acid, which precipitates emetine in an insoluble tannate. Gallic acid and all the vegetable astringents, iodine, iron and lead, are chemically incompatible with emetine.

Therapeutics.—Emetine fills the multifarious role of an emetic,

expectorant, digestive, antispasmodic, hemostatic, diaphoretic and defervescent.

As an emetic it is mild in action and the nausea does not long remain after emesis. It is specially valuable when the indication is to relieve the stomach of undigested food. For children emetine is useful as it depresses less than most other emetics.

The nurse should be warned that sometimes the vomiting does not occur, and that the remedy should be suspended when the bowels act or symptoms of depression occur.

As an expectorant emetine is indicated when there is a deficiency in the bronchial secretion, or when the latter is tough and adherent. Dry cough calls for emetine. This is the case in the early stages of acute bronchitis and laryngitis; and in chronic cases with scanty secretion. When the same condition is present in early phthisis emetine may be given. In spasmodic asthma emetine must be pushed to nausea for benefit to accrue. In whooping-cough it is usually given in the catarrhal stage, with little if any benefit. In fact, the failure of such remedies usually first arouses the suspicion that we have this malady to deal with.

As a digestive emetine is useful in all cases where the digestive fluids are deficient. In very small doses, well within the nauseating limit, it is well suited to gastric and duodenal catarrhs, and to the dry forms of ileocolitis. In most forms of acute intestinal irritations, simple diarrheas, cholera infantum, cholera morbus, whenever the intestinal secretions are vitiated and unhealthy, the stools unduly fetid, emetine, promotes the secretion of healthier products. In dysenteries of the graver types, tropical, foudroyant, it is a specific. Given in doses of a grain with every precaution to prevent vomiting emetine exerts a degree of control over this malady not approached by any other remedy. The patient should be prepared for the night, in bed, and then take the dose in tablets, which must be swallowed whole and dry, with no fluid; he then must lie perfectly quiet for half an hour, and before the expiration of this he will be asleep.

When he awakes in four to eight hours he will be markedly improved. If the dose is vomited it should be at once repeated. Sometimes it will be necessary to first administer a small hypodermic of morphine to insure the retention of the emetine.

Emetine in similar doses administered in the same manner constitutes one of the most effective remedies for delirium tremens. Many times I have given a grain at bedtime to a patient in the be-

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ginning of an attack, and wild with the incessant craving for whisky; within 30 minutes he would be asleep, and after eight hours' rest, awake free from the craving, and ready for his food. This dose produces one or two spinach-colored stools, and if it does not act on the liver there is every appearance of such action.

To obtain antispasmodic effects from emetine it is necessary to administer it in nauseant doses, sufficient to produce muscular relaxation. Given thus it has proved of use in uterine spasm, etc. But the most important application in this group is to the spasms of childhood, usually dependent on unwholesome food and relieved by emesis. Repeated spasms with muscular relaxation form the picture of a case suitable for emetine.

The hemostatic effect is due to the relaxation of arterial tension, and also requires nauseant or emetic doses. But as vomiting itself may favor the hemorrhage the object is to secure relaxation without pushing to the emetic dose. This can easily be accomplished by the intensive method of rapidly-repeated minute doses, stopping the moment nausea is felt.

As a diaphoretic emetine is not of much importance, pilocarpine being immeasurably more powerful. There are few conditions in which Dover's powder is not advantageously replaced by the latter.

The antipyretic influence of emetine does not depend on a direct effect upon the pulse rate or the temperature, unless it is given in toxic doses. The effect is rather to be attributed to the opening of the excretory channels, allowing the materies morbi to pass out of the body. This is best shown in pulmonary inflammations, when emetine is given in doses sufficient to promote secretion and relax tension. Emetine goes very well with the defervescent alkaloids, veratrine and aconitine, but antagonizes digitalin to some extent. As a diaphoretic ipecac has always been administered with opium, as in Dover's powder. The writer has modified this old favorite in accordance with modern therapeutics, by using emetine and codeine, with camphor monobromide. This forms an excellent combination for a diaphoretic and a soothing remedy for dry irritative coughs. It has less tendency to nauseate and constipate than the old Dover's powder, and is more speedily effective and manageable.

For use in chronic constipation and other chronic affections of the alimentary canal emetine is administered with aloin, atropine, strychnine and capsicum, sometimes adding physostigmine for flatulence, or podophyllin to affect the liver more decidedly. For gastric affections, especially of infants, an excellent combination

consists of emetine, rhein or juglandin, and sodium carbonate and sulphocarbolate, with aromatics. Innumerable combinations are made of emetine with other remedies; in fact, it is far more frequently thus used than alone.

In India the treatment of the severe dysenteries common there by ipecacuanha has become established as the standard. Many experiments have been made with ipecac deprived of its emetine, since it is recognized that vomiting must not be allowed. On the whole the evidence is not conclusive as to the superiority of the deëmetized drug. But experiments made by the writer show a great advantage in the use of the amorphous emetine, which has been freed from cephaeline, the acrid emetic principle of ipecac root. I have taken a grain of this in whole tablets with no nausea whatever, though one-twelfth of a grain in warm solution will nauseate me promptly.

Shoemaker enumerates the following uses for ipecac: Locally as a remedy for insect bites, 2 parts to 15 each of alcohol and ether; also in watery solution for rhus poisoning; and the wine sprayed into the air passages for emphysema, fibroid phthisis, winter cough and chronic bronchitis (Murrell); internally very small doses for nausea and vomiting, of pregnancy or of alcoholism; hemoptysis, epistaxis and metrorrhagia; to overcome uterine inertia in the first stages of labor; to free the bronchi of secretion in whooping-cough or in capillary bronchitis; pushed to full tolerance in epilepsy (Bond); dram doses of the powder for cholera morbus and Asiatica; tuberculous diarrhea and night-sweats; torpor of the liver; flatulent dyspepsia; to stimulate the liver in malarial poisoning; catarrhal jaundice; laryngismus stridulus; puerperal hemorrhages and dysenteries (Trousseau); hematemesis (Burland) in dram doses.

King says the specific indication for ipecac is the presence of irritation, even enumerating mental and nervous irritation in his list. His chief indications are: Elongated and pointed tongue, red tip and edges, large or effaced papillæ; tenderness on pressure; contraction of tissues; pinched countenance, white line around mouth, tendency to nausea and vomiting, with or without eructations, and marked hyperesthesia. Hyposecretion, capillary engorgement, cases acute. These indications presenting in gastric, enteric, pulmonary, maladies call for ipecac, or better for emetine. Hemorrhagic cases calling for ipecac are nervous individuals with marked irritability and vascular excitation. Bleeding hemorrhoids are sometimes benefited by this remedy.

A. L. Blesh has sometimes succeeded in having the grain dose retained in cases of dysentery by first partially anesthetizing the stomach with a single large dose of cocaine. At other times a precedent large dose of carbolic acid has accomplished this object.

G. M. Jameson of Buda, Texas, praises emetine for the dry cough; of severe forms of measles. He gives gr. 1-32 to 1-16 every half-hour to one hour.

Blake (*Merck's Archives*) claims that ipecac in full doses energizes the circulation, accelerating the blood-current but lessening its volume, the vasomotor spasm in the skin accumulating the blood centrally, causing congestion and albuminuria. The skin cools and the heat rises internally. In bad hygienic conditions with weak digestion and faulty elimination small doses of ipecac are curative by stimulating ganglionic energy, hastening circulation and promoting the nutritive processes, also by stimulating elimination. In croup it loosens the membrane by the thin mucous secretion exuding under it. In spinal exhaustion, from over-exertion, heat or teething, the blood is centralized, the solar plexus irritated, and vomiting and purging result. Very small doses of ipecac frequently repeated, direct the blood to the surface and relieve alimentary congestion. By increasing capillary innervation it checks choleraic discharges, menorrhages, syncope, and diseases of old age, and causes uterine contractions.

Dosage.—If nausea or emesis is desired emetine should be administered in warm water; but if the effect on the liver, or the hypnotic action is indicated, or if for any reason it is best that the remedy should not be vomited, the granules or tablets should be swallowed whole and dry, that absorption may be slow. As a diaphoretic and for most uses the dose is gr. 1-67 repeated every five to sixty minutes, or less frequently. In dysentery and delirium tremens from gr. 1-6 to gr. j, is the dose, and this may be repeated every 8 to 24 hours.

ERGOTIN.

Standard granule—Gr. 1-6, gm. .01, and tablets gr. 2, gm. .13.

This drug is so well known that it needs but little description. Ergot, ergot of rye, Secale cornutum is the sclerotium of a parasitic fungus, Claviceps purpurea, which replaces the normal grain of rye, Secale cereale. The supply is derived chiefly from Russia, Germany and Spain. Some attempt has been made to replace the standard

article with corn ergot but the latter has not proven satisfactory. Ergot, in its natural condition, is horn-shaped, somewhere in the neighborhood of an inch in length, externally of a purplish black and upon fracture white with a pinkish streak. The odor is disagreeable and peculiar and the taste oily and nauseous.

This body has different active principles and its chemistry has even at this late day yet to be fully settled. Ergotinic acid, cornutine and sphacelinic acid are three impure bodies which have been separated but none of these represents properly the activity of the entire drug. Ergotinic acid is toxic and if injected intravenously causes ecchymoses and wide-spread inflammation; cornutine often causes convulsions and sphacelinic acid causes gangrene. Quite recently Jacobi has isolated sphacelotoxin which he claims represents the active principle of sphacelinic acid. The preparations of the drug are many. The fluids are variable in potency; some are inert and the best are often unfit to be injected subcutaneously. The fluid and solid extracts are used largely and the varying reports as to the efficiency or uselessness of the drug are due to the different preparations used.

Ergotin, which alone is used alkaloidally, is a purified hydro-alcoholic extract of ergot and gives in practice the most even and certain results. This preparation is not affected to any marked extent by age or exposure as is every other form of ergot. It may be given internally or hypodermically with equally good effect and abscesses do not follow its exhibition in the latter manner.

Physiologic Action.—There exists a wide difference of opinion as to the physiological action of ergot. We know, however, that it increases parturient action; that in moderate doses it constricts the arterioles in various portions of the body and, as a result, arterial pressure is somewhat raised. The drug has a stimulant effect upon the vasomotor center and also probably has a direct effect upon the muscular coats of the blood vessels. It is not always suitable for prolonged administration as it has a tendency to produce gangrene.

Given hypodermically, or intravenously, in medicinal doses, the blood pressure is first lowered and then raised, the preliminary fall being supposedly due to the temporary depression of the heart muscle from direct contact with the drug. Given by the mouth its action is rapid; within thirty minutes, often, its effect is apparent and the impression lasts fully an hour. In emergencies (post-partum hemorrhages) from 2 to 5 grains may be given, preferably hypodermically. A fresh solution should be made at the bedside

and the solution may be filtered through sterile gauze if time allows. In severe floodings the dose may be repeated in half an hour and as ergot is really as far as obstetric indications are concerned an emergency remedy, the accoucheur should always provide himself with a supply of a reliable preparation. Many of those upon the market are absolutely inert.

Therapeutics.—In all bleedings from the uterus, whether due to fibroids, cancer or parturient accidents, ergotin is our most useful remedy when pure. In fibroids the drug should be given in smaller doses, either by the mouth or by hypodermic injection. The treatment should be continued for weeks. There is a marked reduction in the size of the tumor and often it seems to become absorbed. In the worst cases it ceases to increase in size.

In the parturient woman small doses induce uterine contractions closely resembling the normal. If full doses are given, however, these become powerful and tetanic. As there is a vast difference in patients' tolerance of this drug, it is difficult to estimate what will be a safe dose. It has therefore become a rule never to administer ergot until delivery has been accomplished. A full dose will then often expel the placenta and cause firm contraction of the uterus. When after the third stage the uterus remains flaccid and "boggy" two or three moderate doses of ergotin (gr. 1 to 2) will cause a marked change for the better. It is a mistake, however, to give ergot as a routine measure as so many practicians are in the habit of doing. In cases known to be post-partum "bleeders" a full dose may be given after the head is born. In subinvolution it is a useful remedy but the possibility of affecting the nursing child should be borne in mind.

Ergotin has proven of undoubted service in metrorrhagia, gr. 1-6 to 1-2 being given every two hours till effects are produced. In hematemesis, hemoptysis and hematuria its use is questionable; in hemoptysis especially it would seem to do more harm than good.

Ergotin causes contraction of the sphincter vesicæ and this often produces annoying symptoms; it is therefore evident that it will prove a reliable remedy in incontinence. It may be combined with strychnine with advantage. Wherever it is desirable to contract involuntary muscular fiber, there ergotin is indicated and as the smaller blood-vessels are largely formed of involuntary muscle fibers it may be given to lessen capillary blood supply. It is therefore indicated in congestive headaches—especially in those of a full habit.

The drug has also been used with success in diabetes insipidus and colliquative sweats. Various writers have also recommended it as a useful remedy in diabetes mellitus, meningitis, myelitis, splenic enlargements, acute dysentery and skin diseases. In all of these, however, with the possible exception of splenic enlargement, it has proved unsatisfactory.

Ergot remains what it has always been, the obstetrician's best friend. Its action upon the uterus is prompt and powerful and, if a reliable preparation is used in sufficient quantity, the desired effect can always be obtained. Given internally ergotin may produce nausea but this form of the drug is less objectionable in this respect than the fluid extracts.

In giving ergotin hypodermically the solutions should not be thrown under the skin but deep into muscular tissue. In this manner the formation of abscesses is almost positively avoided. Quinine, hydrastin, gossypin, can in certain instances take the place of ergotin to some extent. Some practicians are in the habit of administering a full dose of quinine as soon as labor sets fairly in and give a dose of ergotin as soon as or immediately after the head is born.

Ergotin has been recently recommended as an efficient remedy in puerperal fever. It has been used not only as a specific but as a prophylactic. In a series of thirty cases Solt used ergotin throughout the sickness and says every case recovered with a rapidity never before witnessed. Other observers support this claim.

Moderate doses for a prolonged period have been suggested in multiple sclerosis.

In all cases of disordered circulation ergotin, it is suggested, should be given hypodermically. It is capable of restoring tone and equilibrium to the circulation; many writers have recently asserted that it is more valuable than most of the accepted heart tonics. The adminstration by the mouth is condemned. Within the year large doses given hypodermically have been warmly recommended in all acute inflammatory infections. Meningitis, pneumonia, pericarditis and erysipelas are among the diseases enumerated as being successfully treated with ergotin. It has also been found to relieve the serous apoplexy of alcoholics and is useful in pulmonary edema. In conjunction with strychnine, ergotin is recommended in chorea. The convulsive condition is ameliorated and the general tone of the patient improved.

THERAPEUTIC NOTES

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ERYTHROL TETRANITRATE.

Erythrol, also termed erythroglucin, phycite and erythrite, is a principle existing in many lichens and in some algae. The tetranitrate is explosive on quick heating or percussion, like nitroglycerin. It is given in the same manner and for the same purpose, that of quickly dilating the capillaries. It is slower in action and more lasting. The dose is gr. ½ to one grain, repeated every four to six hours. It may be given in tablets. The field of this agent seems to be amply covered by sodium nitrite.

EUONYMIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Euonymin is a resinous body derived from Euonymus atropurpureus, wahoo. By the same name is designated a crystalline glucoside whose action closely resembles that of digitalin.

Felter and Lloyd term euonymus tonic, laxative, alterative, diuretic, and expectorant. It has been used successfully for intermittents, dyspepsia, torpid liver, constipation, dropsy and pulmonary affections. It stimulates the flow of bile, and is recommended for ague after quinine has broken the chills. It stimulates digestion and improves appetite. It may be used for atonic dyspepsia, indigestion from torpid liver or from malaria, for chronic malaria and the indigestion, constipation and gastric debility with or after it; for dropsy with hepatic and renal inactivity.

Specific Indications.—Prostration with irritation of the nerve centers; periodic diseases, to supplement quinine; anorexia, indigestion, constipation, all from hepatic torpor.

Ellingwood says euonymus is actively cathartic and alterative, through its influence on the glands. He considers it indicated in phthisis with night-sweats and great weakness, dropsies following acute affections, convalescence from severe agues, enlarged liver and chronic bronchitis. It is a good remedy for indigestion and constipation with yellow conjunctiva and around the mouth, the tongue coated similarly. Also for torpid liver and weak digestion, constipation and lithemic neuralgia. It is a hepatic stimulant, improving the protoplasmic function of the liver and increasing the bile.

Shoemaker says euonymus first increases and then lessens the excretion of uric acid. It is said to cause the disappearance of the

albumin from the urine in nephritis. It also relieves that form of lumbago that is rather a soreness than actual pain.

The dose of euonymin for an adult is gr. 1 to 3, at bedtime.

Of Merck's white euonymin Van Renterghem took gr. ⅓ every hour till 10 doses had been taken. Two soft stools were passed, without the least pain in the abdomen, no influence on the appetite or the pulse. He also tried the brown and the green euonymin, in doses up to gr. xv each. It was only on passing doses of six grains that he felt, six or eight hours after taking it, a slight increase in peristalsis, followed by the usual stool. Even 15 grains did not cause laxity or colic. No effect on the pulse.

Evidently euonymin is not to be looked upon as a violent drastic. Its effect seems to be in the line of correcting abnormalities in the hepatic functions. Senator praised it as a remedy for jaundice, the simple catarrhal form. In duodenal catarrh it has done well in the hands of the writer; giving gr. 1-6 every two hours, or a much larger dose at bedtime.

EUPURPURIN.

Standard granule—Gr. 1-6, gm. .01.

Eupurpurin is a concentration from the Eupatorium purpureum, queen of the meadow, or gravel root.

Lloyd says this plant possesses diuretic, subastringent, stimulant, tonic and antilithic properties. It has a specific action on the kidneys, increasing both the solid and the liquid constituents of the urine. Even those who will not allow its repute of dissolving calculi admit that it controls the irritation of the bladder caused by these bodies. It has also been advised in renal dropsy, chronic mucous affections of the gastrointestinal tract, post-scarlatinal dropsy, difficult and painful micturition with frequent desire to urinate, the passage seemingly obstructed; pain and weight in the loins extending to the bladder, urine scanty and high-colored, or mixed with blood; chronic vesical irritation, a sense of heat in bladder, urine milky and loaded with mucus, adhering to the vessel; strangury from irritant drugs or blisters, shooting urethral pains, vesical tenesmus and frequent micturition; hematuria and recent prostatitis after the acute stage passes; irritable bladder in children; and of pregnancy; diabetes insipidus; vomiting of pregnancy accompanied by coughing when a little urine escapes; efficient in albuminuria; gout and rheumatism; chronic cough with weak cir-

culation and in asthma, catarrh and unduly prolonged whooping-cough; impotence; female disorders; chronic irritability of the womb and atony; habitual abortion from prolapsus, retroversion, debility from chronic metritis, or other atonic states; as an injection in chronic amenorrhea with great debility and constant leucorrhea.

Specific Indications.—Vesical irritation, incontinence of urine, painful and frequent urination, urine scanty and milky with mucus or blood; uric acid diathesis; pain and weight in loins extending to bladder; skin dry, hot and constricted.

Ellingwood terms it specific for irritation of the bladder from displacement and chronic metritis; suppression of urine partial or complete, during or after pregnancy. He says it is also of service in chronic endometritis, insufficient labor pains, ovarian and uterine atony, dysmenorrhea, burning or dull aching ih the bladder, anasarca, ague with lumbar chills, violent shaking with little sweating, severe bone pains, frontal headache, weak tired feeling, hectic with night-sweats; it increases retrograde metamorphosis and eliminates the poison causing rheumatism; acts on the ganglionic system and improves digestion.

The dose of eupurpurin is from gr. 1-6 to 1 three or four times a day. It is usually best taken in hot water, before meals and at bedtime. In the chronic maladies in which it is recommended quick results are scarcely to be expected. Give moderate doses for a month at least.

Buckley recommended eupurpurin for colicky pains and similar attacks pointing to affections of the lumbar region, and in chronic catarrhal diseases of the bladder and kidneys. He gives one or two granules every two or three hours.

GELSEMIN. GELSEMININE.

Standard granules—Gelsemin, gr. 1-134, gm. .0005; gelseminine, gr. 1-250, gm. .00025.

Two alkaloids are derived from Gelsemium sempervirens, gelsemine and gelseminine. The first resembles strychnine in its action but is much weaker. Gelseminine is a powerful poison, resembling cicutine in most of its effects (Cushny). To the latter the effects of the crude drug are due.

Physiologic Action.—The symptoms from gelseminine are quite similar to those of cicutine, but the former depresses the central nervous system more. Death is caused by paralysis of the respira-

tory center. Applied locally it dilates the pupil widely, less so when taken internally. The power of accommodation is lost. But this action differs from that of atropine in that gelseminine causes paralysis of the inhibitory ganglia while atropine paralyzes the terminals. Gelseminine does not increase the arterial tension.

It is one of the most certain and powerful depressors of the motor nerves. Toxic doses cause drooping of the upper eyelids, and this is the signal for stopping the medicine. Reflex irritability is lowered, the gait is staggering, numbness is manifest, but the cerebral functions are unimpaired until carbonic acid poisoning sets in. The pulse is slowed only as the excitomotor cardiac ganglia are affected. The temperature is lowered. Great muscular weakness ensues. The arterial pressure falls.

Poisoning from gelsemium calls for stimulant doses of strychnine, hot drinks and pediluvia, rubbing and other means of keeping up the heat, and artificial respiration. The stomach should be evacuated. Atropine and morphine hypodermically are advocated by Shoemaker. Tannic acid, alkalies and their carbonates are chemical antidotes. A dram of the fluid extract has caused death.

Felter and Lloyd say that small doses relax the muscles and allay nervous irritation, causing a pleasant sense of ease; larger doses cause the lower jaw to droop as well as the eyelids; vision is confused, and still larger doses paralyze the spinal cord. Toxic symptoms are profound prostration and muscular relaxation, dropping of the under jaw and upper eyelids, dilated pupil and diplopia. The temperature falls and the pulse slows to 30 beats. Death has followed the ingestion of 12 minims of fluid extract by a child of three years. Poisoning is alleged to have occurred from the use of honey gathered from the jessamine blossoms.

Therapeutics.—Gelsemium acts particularly on the cerebrospinal centers, lessening their supply of blood; hence its use in all cases wherein there is a determination of blood to the brain and cord. While these writers recommend it for all cerebrospinal inflammations they say it is never the remedy for congestion. Scudder gives as specific indications, the flushed face, bright eye, contracted pupil, increased heat of head, great restlessness and excitation. With these may be general headache. Such conditions arising, gelsemium will be found of use in bilious, remittent, typhoid and malarial fevers. It is best adapted to the earlier stages of fevers, sthenic forms, and is to be stopped the moment its physiologic effects are manifest, to avoid the subsequent depression. It is said that the full constitu-

tional effect impairs the tonicity of the cardiac muscle. It is of marked value in pneumonia, pleurisy, and especially in puerperal fever. Chilly sensations on movement indicate it. Bloyer says it is specially useful for nervousness with exaggerated complaints over trifles—"touchiness." It allays excitement and restores secretion to prepare the way for quinine; in children's fevers and convulsions from dentition, gastrointestinal inflammations, cholera infantum, diarrheas and dysenteries; in hysteria, convulsions with muscular cramps, neuralgia with powerful nervous twitchings, toothache of pregnancy and of periodentitis, facial neuralgia from caries, cold or nerve excitation; insomnia, pain from nervous tension, and local hyperemia; headache from eye strain, migraine, nervous, bilious and in myalgia and tic douleureaux—give in small and rapid dosage. For ovarian neuralgia give full doses. It relieves intercostal neuralgia, sciatica, dysenteric tenesmus, bowel spasms, chorea, epilepsy, tetanus, urinary spasms, passage of renal calculi, scanty urine with irritation of the passages, anuria from irritation not congestive; it is the remedy for dysuria from spasmodic urethral stricture, hysteric retention, gonorrhea and spermatorrhea in plethoric; in early chordee no remedy is so prompt. In spasmodic conditions with cystic catarrh, inflammations along the genitourinary tract; pelvic maladies of women, ovaritis, metritis and salpingitis, dysmenorrhea and uterine colic, rigid os uteri with dryness, it relaxes all sphincters, thus facilitates labor—give free doses. Alone or with pulsatilla it overcomes the nervous restlessness of parturients and the nervous tension following labor, as well as afterpains and some leucorrheas. By blunting peripheral sensation it relieves the itching of eczema and prurigo; applied locally. It has succeeded in delirium tremens, mania and paralysis. King used it with advantage in iritis, conjunctivitis, muscular asthenopia, and tinnitus aurium, giving small doses every four hours and carefully avoiding depressing effects. Parrish obtained benefit from it in alcohol and opium habits.

Gastrointestinal irritation with a sense of rawness, heat and pain, knotty contraction in the stomach, call for gelsemium. In the exanthemata great heat and restlessness call for this remedy, and it is nearly always required in cerebrospinal meningitis. No one remedy was more frequently indicated in influenza, with persistent fever and headache, with great excitability. It has been used in whooping-cough, spasmodic cough, spasm of the glottis, asthma, hysteric cough, excessive heart action of hysterics, vertigo, hemorrhages, ague-cake, gout, rheumatism, bronchitis, laryngitis, albuminuria, and

many other affections. This long list shows how great is the repute of gelsemium with the eclectics. Felter and Lloyd give as specific indications: Bright eyes, contracted pupils, flushed face, great heat and restlessness; mental irritability; insomnia with excitation; pain over the whole head; dysuria with scanty urine, irritation of the urinary tract; pinched, contracted tissues; thin, dry, unyielding os uteri with dry vaginal walls; chilly sensations on motion; hyperemia, and convulsions.

Ellingwood says the earlier successes with gelsemium were due to the full doses given. Children are more susceptible than adults to it. In spasms maximum doses are needed. Toxic effects are readily recognized and obviated without harm resulting. Gelsemium is quickly eliminated through the kidneys and the doses must be soon repeated. Single, full doses should be given only to adults. In one case evidences of poisoning came on in 45 minutes after taking a dram of the fluid extract.

To Lloyd's list he adds: Recent torticollis, laryngismus stridulus, irritable heart-action, acute nephritis from cold, acute cystitis with great irritation and spasm; neuralgias nearer the head are more under its control.

Synergists.—Macrotin when the muscles are affected, heart and genitourinary cases; passiflora, bromides, chloral, cicutine, physostigmine, veratrine. Antagonists are alcohol, strychnine, digitalin, ammonia, and to some extent atropine and caffeine. Coffee is an antidote.

Shoemaker says gelsemium is frequently beneficial in lumbago; might control the spasms of hydrophobia; as a substitute for morphine. Ringer found the tincture beneficial in small doses—m. x t. i. d.—in Meniere's disease. It will sometimes arrest attacks of bilious colic, in doses of m. 5 every fifteen minutes. It is of considerable service in treating hemoptysis, and a full dose may abort an acute coryza. Nottage found it useful in menopause headaches with flushes, head and body hot—gtt. 2 to 3 every three hours.

Walling took gelseminine every fifteen minutes to break up a cold. Four doses did the work and induced dizziness. Another case took six granules with like success; but the patient said the medicine made him drunk. These doses were gr. 1-134 each, and they were evidently too strong. Reducing to gr. 1-250, no further trouble was experienced.

Dr. M. G. Price of Mosheim, Tenn., cured a case of neuralgia with gelseminine after the galenic preparations of the same drug

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had proved worthless. In influenza Barnes gives gelsemium with strychnine for the fever, aches and pains, cough and restlessness. He credits it with a special action on the ophthalmic division of the fifth nerve.

The virtues of gelsemium are fully represented by gelseminine, and this alone should be used, the concentration gelsemin being dropped, and the galenic preparations also, for their uncertainty. The dose of gelseminine is gr. 1-250 repeated every quarter-hour in acute cases and every two hours in chronic ones.

GERANIN.

Standard granule—Gr. 1-6, gm. .01.

Geranin is a concentration from the rhizome of Geranium maculatum. The active principle is tannic acid, which in the dried root changes to gallic acid. The yield varies from 28 per cent in spring to 10 per cent if gathered in October. The virtues of geranium are those of the vegetable astringents. Whether there is any advantage in using the plants instead of the pure tannic acid each physician will decide for himself.

Therapeutics.—As an astringent geranin may be employed in the relaxed stages of diarrheas, dysenteries, choleraic affections, and locally for hemorrhages, ulcers, aphthae, ophthalmia, gleet, leucorrhea, salivation, and any place where an astringent is indicated. It has also been given internally for diabetes, menorrhagia, hematuria, chronic mucous discharges, of all kinds. In chronic pharyngeal catarrh it has been employed as a gargle; and it has been advised even as a remedy for incipient tuberculosis. King recommends it with aletris for diabetes and nephritis. It is applied to bleeding hemorrhoids, epistaxis, bleeding from small wounds and from tooth cavities, etc. King wisely advises the addition of berberine in most of the cases enumerated above. Like other of the tannin astringents this is advised as pleasanter and less irritant than the acid itself, and this may be true. But the use of tannic acid in granules leaves little to be desired when a vegetable astringent is indicated.

GLONOIN.

Standard granule—Gr. 1-250, gm. .0025.

Glonoin is the one remedy whose effects are more quickly manifested when taken by the mouth than when administered hypodermically. Within a minute after taking a dose the patient feels

a sense of fullness in the head, with throbbing, and the face and neck flush. Darwin pointed out that the area affected corresponds exactly with that of ordinary blushing. Brief headache follows, and a sense of impending dissolution if the dose has been too large. If very large doses are taken there is vertigo, prostration, and stupor. The respiration is rapid, and irregular, but shallow. Within five minutes these effects pass off, and leave the patient none the worse. There is an instant and profound fall in the vascular pressure, due to dilatation of the arterioles and veins of the surfaces of the body. The pulse is faster. The dilatation of the vessels is believed to be due to a direct action on the muscular fibers of the vessels. The rapid pulse is due to depression of the inhibitory center in the medulla. Large doses directly weaken and slow the heart. The faster breathing is due to a direct action on the respiratory center in the medulla. With lethal doses the respiration becomes shallower and death occurs from paralysis of this center. The urine is slightly increased, especially if the renal vessels are contracted, as in cirrhosis; but if normal there is a decrease in the urine from relaxation of the pressure in the renal artery. No effect is exerted on the higher cerebral centers except indirectly through the dilatation of their vessels. Some anomalies of sight follow large doses. Convulsions may follow toxic doses. The temperature is lowered to an unimportant extent. The blood may be darkened by the formation of methemoglobin.

Glonoin is partly decomposed in the blood, and partly excreted by the kidneys.

So far Cushny conducts us. Shoemaker says glonoin lessens reflex excitability, retards oxidation, and in large doses stops the heart in diastole.

Therapeutics.—Brunton introduced the nitrites as remedies for angina pectoris, in which they speedily give relief by relaxing the spasm of the arteries and relaxing the vascular tension. The instantaneous relief from agonizing pain and imminent danger, forms the most striking exhibition of therapeutic power known. In other spasmodic affections this remedy acts equally well; and it has well earned the designation of "the life-saver." The paroxysm of spasmodic asthma relaxes at once after a few granules of glonoin. In the case of renal or hepatic colic, due to the passage of calculi, a granule of glonoin is administered with one each of atropine and strychnine arsenate, to open the bloodvessels and permit a speedier action of the more enduring remedies. The pain is relieved quickly

by glonoin and the effect is prolonged by the atropine. In many other cases glonoin is given for this purpose of hastening the action of other remedies.

In cirrhotic nephritis, when the pulse is tense and small, the heart hypertrophied, glonoin has been given with the best results, to relax the tension and obviate the dangers arising from this condition. Here there has been observed a toleration of the drug, until in one instance the incredible dose of six grains has been recorded. However, as this is a remedy whose effects are evanescent it seems better to use it for quick effect and to rely upon veratrine to keep up a continuous depression and relaxation of the circulation.

On the heart the effect needs to be carefully studied that the benefits of this invaluable remedy may be secured without its dangers. By sending the blood quickly to the head it at once stops fainting, syncopal attacks; but the drop in vascular tension is perilous. It is better to give glonoin with brucine which acts quickly enough to counteract the subsequent depression. In obstructive diseases of the heart, small doses of glonoin relieve the weak heart by relaxing the arterial tension and thus making the work easier. But as the effect is over in a few minutes this use of glonoin is much overrated. Nor when given with digitalin can glonoin be relied upon to counteract the increase of vascular tension caused by this powerful drug (as in the combination of glonoin, digitalis, strophanthus and belladonna) whose effects endure for days. The prescription attributed to Da Costa never came from that great therapeutist. Here also veratrine would accomplish the indication far better.

It has been advised to add the allied agent amyl nitrite to chloroform when used for inhalation, as the former counteracts the tendency to cerebral anemia; but the same objections hold good, and the result can not fail to be an increase of the danger.

Headache due to cerebral anemia is relieved momentarily by glonoin but much better by atropine.

In the first stage of an epileptic convulsion the condition is a cerebral anemia, and this may be instantly removed and the convulsion aborted by glonoin. Add atropine to prolong the effect, and we have a remedy whose efficiency the writer has proved in many cases. Sometimes the convulsive tendency is too strong to be permanently postponed in this way, but in others the patient has kept the fits away for months by resorting to the remedy whenever the

impulse to a spasm is felt. Time is given for etiologic treatment, while the striking effects of the glonoin aid in breaking up the habit.

Glonoin has been advised to relieve the craving of the habitue for opiates; as a remedy for morphine poisoning; in Raynaud's disease—where also the writer has used it with benefit and substituted veratrine with much more—and for poisoning from illuminating gas.

Shoemaker cautions against tablets of too great strength as liable to explode.

In the alleged sunstroke that is really heat exhaustion, with relaxation, feeble pulse and syncope, the best treatment is by glonoin, atropine and brucine, administered intensively.

Ellingwood says glonoin has controlled many cases of post-partum hemorrhage. He speaks of giving it hypodermically in cases of drowning, gas poisoning, and opium poisoning with uremic symptoms; it has caused relaxation in tetanus; and in pallor with palpitation.

Bartholow recommended glonoin to ward off the chill of ague.

Dr. M. G. Price, of Mosheim, Tenn., finds glonoin very effective in gastralgia of adults and of children; in eclampsia with high tension this is abated by it; in dangerous collapse and syncope this is above all the remedy.

Abbott says glonoin relieves congestion. He advises it in high temperatures with pale skin.

Dr. S. J. Smith with glonoin saved the life of a man who was poisoned by aconite.

Dr. A. H. R. Ginley gave glonoin to a child with cyanosis neonatorum for two weeks, finally saving its life.

Dr. D. S. Ross reports the case of a man 84 years old, unconscious from the onset of pneumonia. He regained consciousness with glonoin and recovered.

Dr. J. F. Brenckle reports a case of a woman two weeks over confinement, seized with gastralgia and dyspnea, with weak rapid pulse. She was almost immediately relieved by glonoin and strychnine and digitalin. Pericarditis with effusion was present.

Dr. R. V. Pearce records what was really a case of glonoin habit, the patient taking it under the mistaken idea that it was necessary as a heart tonic.

Dr. W. O. Hamilton used glonoin in an infant with opium poisoning, with success when amyl nitrite had failed; also in

asphyxia from hypertrophied tonsils, malarial chills, emphysema, syncope with hourglass contraction in abortion.

The granules of glonoin are too strong. Many persons like the writer cannot take gr. 1-250 without disagreeable effects. A dose of gr. 1-500 would be preferable. This should be given every five minutes, or several granules at once—always crushed—in emergencies. Flushing of the face or a sense of fullness of the head, are indications of full therapeutic effect, when the remedy should be suspended.

GOLD.

Standard granules—Gold bromide, gr. 1-67, gm. .001; gold chloride, gr. 1-67, gm. .001; gold and sodium chloride, gr. 1-50; gold and sodium chloride, gr. 1-20.

The effects of gold closely resemble those of mercury. The action is slower in being produced when given in medicinal doses but the effects are more lasting. In a case of salivation from gold the writer was months in getting the affection under control.

Gold has bactericidal powers even superior to those of mercury. Especially are these shown against the tubercle bacillus (Shurley and Gibbes). It increases the secretions and excretions in general, as does mercury, and stimulates metabolism. The vital processes are quickened universally, the red cells and hemoglobin increased, and a rise of temperature caused. Like corrosive sublimate the salts of gold are corrosive when concentrated, and cause vomiting, diarrhea, and similar evidences of gastrointestinal irritation. The urine is increased, and too large doses cause renal hyperemia and albuminuria. The property of increasing the sexual appetite and powers in both sexes has been attributed to gold, but if true this effect is pathologic. Here too the effect parallels that of mercury.

Gold is eliminated by the kidneys, the liver and the bowels.

Therapeutics.—Gold bromide has been tried largely as a substitute for the big-dose bromides in epilepsy. There is a bromide effect obtained from the gold that is truly remarkable when one considers the minute quantity of bromine in it; but it is better as an adjuvant than a substitute. Give sodium bromide till evidences of bromism appear, then add the bromides of gold, arsenic and nickel successively, and excellent results are obtained. Care must be had in pushing this remedy to toleration, as the salivation is not indicated by tender teeth as with mercury. Auric fever and gastric disorders are caused by the overdoses. Thus employed, the bromide treatment

is a valuable auxiliary to the rational methods indicated in this disease.

Shoemaker credits gold with a valuable action in atonic dyspepsia, nervous dyspepsia, gastric catarrh, torpid liver, etc.; but in all these there is no evidence to show any advantage over mercury, which is cheaper, easier to obtain and to handle. In the early stages of cirrhosis gold has been given with asserted advantage. As cirrhosis means a destruction of gland cells and replacing them with connective tissue, it cannot be supposed that any remedy can renew the lost tissue. But if there is enough gland tissue remaining to keep the patient alive today, it should suffice for tomorrow; if only the cirrhotic process be stayed. And possibly gold may contribute to this end. At any rate it has been largely given in cirrhosis of the liver and of the kidney, with asserted advantage; and Culbertson reported relief of albuminuric retinitis from this remedy.

Gold has been used for arteriosclerosis, the vertigo of the aged dependent thereon, and for that due to indigestion. The iodide of arsenic has proved very useful in these cases and the iodide of gold would probably be still better.

Gold has been advocated in whooping-cough, laryngismus stridulus, hysteria and in functional impotence. It is useful in amenorrhea and dysmenorrhea due to deficient innervation, and as a preventive of abortion, as mercury is in similar cases. From the physiologic action Shoemaker deduces its value in spinal sclerosis, premature senility, depression and hypochondria, neurasthenia, progressive general paralysis, utero-ovarian congestion, menorrhagia, subacute metritis, nymphomania and spermatorrhea. Better based is Strahan's recommendation of this metal in cerebral anemia.

Sometimes syphilitics cannot bear mercury and gold will take its place. We believe the effects are rather more enduring, but it is only in exceptional cases that the more costly metal in indicated. It is usually given in tertiary forms.

Robinson found gold cured two cases of diabetes mellitus; and many subsequent cures have been claimed from various salts of this metal.

Lydston reported success in treating pyelitis with gold hypodermically.

Calmette says the venom of the cobra may be antidoted by injecting a one per cent solution of gold chloride, 2 to 2½ drams, into and about the wound, not more than 15 minims at one spot. The solution may be thrown into the connective or the muscular tissue.

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Injections are also made at the ligature about the limb, and above it. When done, the ligature may be removed.

Shurley and Gibbes reported success in treating tubercular phthisis with hypodermics of gold and sodium gr. 1-20 to 1-6 for several months.

Reviewing the evidence in regard to gold, we are unable to find positive proof of its utility in any malady except syphilis; though it may be useful, and is surely deserving of trial, in tuberculosis, cirrhosis, and injected locally in cancer and lupus.

The dose of any of the salts is the same as of corrosive sublimate—gr. 1-67 to 1-6 up to the appearance of evidences of approaching salivation.

GOSSYPIN.

Standard granule—Gr. 1-6, gm. .01.

Gossypin is a concentration from the bark of the cotton root, Gossypium herbaceum. The virtues appear to reside in an acid resin.

Cotton root is an emmenagog, and was used by southern slaves as an abortifacient. It has the repute of acting much less acridly than ergot and without much general disturbance. Felter and Lloyd recommend it in uterine inertia, chlorosis with amenorrhea or dysmenorrhea, etc. It has been praised in hysteria, anemia of the sexual apparatus with lack of desire and pleasure; also for impotence, subinvolution and uterine fibroids, but is not to be used if there is irritation or tendency to inflammation. It is a stimulant diuretic.

Specific Indications.—Uterine inertia during parturition; menses delayed with backache and dragging pelvic pain; fullness and weight in bladder, with difficult micturition; hysteria with anemia of genitals, sexual lassitude.

Ellingwood pronounces gossypium of value in suppression of the menses from whatever cause; producing firm, regular and strong uterine contractions. It is a hemostatic of some power, for uterine fibroids and incipient cancer; valuable in menorrhagia and metrorrhagia.

Phillips found cotton root useful in hemoptysis. It has been used in the West Indies for dysentery, and Poteyenke employed it as a general hemostatic, especially in a peculiar epistaxis which had resisted other remedies.

The writer's uses of gossypium have been disappointing. Possibly the fresh plant contains virtues not present in the preparations of the pharmacy.

GREGORY'S SALT.

Standard granule—Gr. 1-67, gm. .001.

Gregory, of Edinburgh, gave a process for the extraction of morphine, which consisted in precipitating by calcium chloride, a concentrated solution of opium; an insoluble meconate of lime formed, and the chlorate of morphine remained in solution; which was crystallized by concentration. Robiquet found that the product did not correspond with the chlorate as indicated by reaction, and suspecting that the salt was impure, he isolated the morphine by means of ammonia, and obtained with potassa a new precipitate, soluble in ether and crystallizing admirably in presence of water. This proved to be codeine, and the salt procured by Gregory a mixture of the chlorates of morphine and of codeine.

This salt has been used by the French dosimetrists to some extent, and is preferred to morphine. In America codeine itself has largely replaced morphine as a remedy for coughs, and there seems little space for Gregory's salt. Possibly it may answer to throw some too wise patient off the track, as the older physicians were accustomed to do when they prescribed Aquila alba, or Panchymagogus que roetanus for calomel. Gregory's salt is about half the strength of morphine, but is obviously subject to the variability of opium itself, as to the relative proportions and actual amount present of each.

GUARANINE.

Standard granule—Gr. 1-67, gm. .001.

Guaranine is an alkaloid obtained from the Paullinia sorbilis, a plant found in Brazil. The alkaloid is practically identical with caffeine, containing a small proportion of theobromine in addition. The action and therapeutic applications are the same as with caffeine, and to detail them here would be a useless repetition. The presence of theobromine may render guaranine slightly more diuretic.

HAMAMELIN.

Standard granule—Gr. 1-6, gm. .01.

Hamamelin is a concentration from Hamamelis Virginiana, the witch-hazel. No glucoside or alkaloid has been obtained from Hamamelis, which contains tannic and gallic acid, and a volatile oil.

Felter and Lloyd term witch-hazel tonic and astringent. They speak of its use in hemorrhages, diarrhea, dysentery, excessive mucous discharges with full, pale relaxed tissues; in incipient phthisis; as a local application for painful swellings and tumors, sore mouth, external inflammations, prolapsus ani and uteri, leucorrhea, gleet and ophthalmia. Its most pronounced virtue is in affections of the veins, its tonic action being markedly shown in varicosities, hemorrhoids and hemorrhages. The parts are usually pale and relaxed, though sometimes the deep red of venous engorgement is seen. It is adapted to the whole venous system.

Scudder and others have found it a valuable remedy in passive hemorrhages and congestions, epistaxis, hemorrhoids, phlegmasia dolens after the acute phases, phlebitis and varicose veins; diarrhea, chronic pharyngitis, chronic uterine congestion, where the cervix is enlarged without abnormal hardness; the os soft, open with leucorrhea and prolapsus possibly; diarrhea with passive hemorrhage; chronic vascular conditions of mucous tissues, and old flabby ulcers. Howe gave hamamelis in uterine hemorrhages with success; in menorrhagia and bleeding after abortion no other remedy did as well; in postpartum cases it is not equal to ergot; it is valuable in chronic diarrhea and in cholera infantum; arrests oozing of blood from mucosa, and in non-inflammatory hematuria. It is often of value in renal affections due chiefly to vascular relaxation; diabetes insipidus, mucous profluvia of the urinary tract, vesical catarrh, and irritation of the bladder from varicocele. In female disorders it is indicated by venous fullness and relaxation; dull aching ovarian pains; leucorrhea with fullness of the pelvic veins and relaxation of the utero-vaginal walls; ovarian and testicular congestion; ocular and conjunctival hemorrhages; sprains, contusions, wounds, with Asepsin as a dressing for small wounds; with hydrastis for irritation of the external auditory meatus; chafing; diffuse cutaneous inflammation; subacute sore throat; scarlatinal angina; tonsillitis, phlegmon of throat, diphtheria, acute pharyngitis, chronic conjunctivitis with vascular lids; mastitis; soreness of abdominal muscles after childbirth; muscular soreness and aching from any cause; tan, freckles, sunburn, dilated facial capillaries, as

a wash after shaving; an injection for gonorrhea; an ointment for piles.

Specific Indications.—Venous debility with relaxation and fullness; pale mucosa—or deep red or blue from venous engorgement or stasis—mucous flow with venous fullness; passive hemorrhages, varicoses, capillary stases, hemorrhoids with sense of fullness; relaxed and sore throat; dull ache in rectum, pelvis or female genitals; perineal relaxation with fullness; muscular relaxation, soreness, aching or bruised feeling; from cold, exposure, injury, strain or physical exertion.

Ellingwood says hamamelis is useful for bleeding from a tooth cavity, from the posterior nares, or from spongy gums; quickly cures acute hemorrhoids and with collinsonia greatly benefits chronic cases; and gives prompt relief to burns and scalds.

In all cases where possible this remedy should be given internally and applied locally at the same time. The specific virtues probably reside in the volatile oil, and are lost in the galenic preparations, which owe whatever value they may possess to the tannic acid present. As to the indications—the whole story is told in the two words: Relaxed veins.

Hamamelin may be given in doses of gr. 1-6 to 2 every hour or two.

HELENIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

The introduction of alkaloidal medication will undoubtedly result in the rescue from neglect of some remedies formerly prized, but which have fallen into disuse from the uncertainty attending the use of the old preparations. Among these is elecampane, so highly valued once that there must have been some reason for its popularity.

Alant-camphor (helenin), is a yellow, hard mass, obtained by steam distillation from the root of Inula helenium. Recent investigations prove this substance to be a mixture of a fluid and a crystallizable substance, which can be separated by pressing between blotting paper.

Helenin is the name given also to a stearopten, obtained as a by-product with alantol by mixing water with the alcoholic extract of the root, and repeated recrystallization of the precipitate. This forms large, colorless, loose, bulky needles, melting at 231.2 F., almost insoluble in water, easily so in alcohol, ether and oils. It is not volatile unless decomposed. It does not form salts with acids or alkalies but is decomposed by them.

Physiologic Action.—In doses of 0.01—0.05 many times daily, in health, helenin produces no notable effect. One part suffices to prevent putrid decomposition in 10,000 parts of urine (Korab). The local application if too long continued causes erythema.

This agent acts primarily on the mucosa, especially of the respiratory organs, on the lymphatics and the glands. It renews the functional activity of these organs and gives new energy to the tissues, as shown by improved secretions. Having entered the fluids it favors vegetative metamorphosis, liquefying and dissipating exudates—a quality that explains the curative action in specific dyscrasias (Van Renterghem).

Therapeutics.—It is a stimulant to the digestive organs, the circulation and the principal secretions. Larger doses cause nausea and vomiting. It is then a tonic aromatic, with expectorant, diuretic and diaphoretic properties. This remedy may be utilized in atonic dyspepsia, general debility, torpid dysmenorrhea, pulmonary and bronchial catarrhs, exanthematic fevers with retarded eruptions, and even in the depression following the introduction of a poison or venom (Gubler).

Huesemann speaks of its local use for pruritus.

Knakstedt pronounced it very efficacious against eczema and other skin affections, especially the itch; applied locally and taken internally.

Valenzuela, Korab, Blocq and others, publish accounts little short of miraculous, of the effects of helenin on respiratory maladies, and as an antiseptic in dressing wounds. In tuberculous and other forms of pulmonary phthisis, chronic bronchopneumonia and whooping-cough, it gave good results. One chronic bronchopneumonic, aged 46, had for eight months resisted all treatment. He was given helenin, gtt. v—x daily, and was cured in fifteen days. A consumptive, aged 36, with tuberculous foci in both lungs, hemoptysis, etc., took helenin 0.01 ten times a day for two weeks, with rapid improvement, and both lungs became permeable. In all cases improvement resulted. In chronic bronchitis the cure nearly always proved complete.

In whooping-cough the efficacy of helenin is termed marvelous, every case resulting in a cure surprisingly rapid. The drug was given internally. Simultaneous inhalations of helenin gave no advantage. The cough always remitted, as well as the dyspnea and thoracic pains, all ceasing completely, without the least sign of

narcotism. The sputa lessened and became gelatinous, an effect so special that it could not fail to attract attention.

On the digestive tract helenin exerts a very marked tonic action, increasing appetite and aiding digestion, even in phthisics with unconquerable anorexia.

Commenting on these glowing accounts, Van Renterghem describes the case of a lady, with chronic laryngitis and acute exacerbations. She improved under other treatment but the hoarseness persisted, with incessant cough. He gave her helenin 0.01 every hour. By the second day she had improved, and a cure resulted within two weeks.

In another case, spasmodic asthma, chloro-anemia and bronchitis, with evening fever, cough, debility, green purulent sputa and anorexia, helenin was given, 0.01 every hour; with strychnine 0.0005, quassin 0.001, sodium arsenate 0.001, four granules each before meals; and daturine a granule every half-hour till effect, to cut the asthmatic attack. The treatment was crowned with success, all symptoms disappearing within three weeks.

Helenin is a remedy with a future. Its special action on the respiratory mucosa indicates its elimination by the lungs. The inefficiency of the inhalation of helenin indicates that, like arbutin, it is transformed in the body. Though not a specific for all pulmonary maladies, helenin is still a very valuable acquisition, in all forms of chronic bronchitis, simple or diathetic; in chronic lobular pneumonia; and in whooping-cough. This list may be extended by further essays of the remedy.

Merck says alantol is an internal antiseptic and anticatarrhal; used in pulmonary tuberculosis instead of turpentine. Dose 0.01, t. i. d.

As helenin does not exert any evident action in health no indication of physiologic effect can be given. The usual dose is 0.01 (gr. 1-6) every one to two waking hours. Elecampane formerly had a reputation as a remedy for snake bites and other poisonous wounds, but no recent essay of its virtues has been recorded.

HELONIN.

Standard granule—Gr. 1-6, gm. .01.

Helonin is a concentration from Helonias dioica.

This plant contains a neutral principle soluble in alcohol and water, whose properties have not yet been studied, further than that it is said to act as a "heart poison."

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The American Dispensatory gives the following information: Helonias is tonic, diuretic and vermifuge, in large doses emetic and when fresh sialagog. It has proved useful in dyspepsia, anorexia, and to remove worms; indigestion, and malassimilation due to disease or reflex from the female genitals; chlorosis from the same cause; the gastric symptoms of nephritis; colic, genital atony, nocturnal emissions from excess, with impaired memory and apathy; general weakness and dull renal or lumbosacral pain; as a uterine tonic in amenorrhea, dysmenorrhea, leucorrhea and to remove the tendency to repeated miscarriages; it relieves the irritability and despondency attending uterine disease; dysmenorrhea with pelvic distention, the womb feeling as if ready to fall out of the body and aching; best here in small doses; vomiting of pregnancy; diabetes insipidus; distinctively a uterine tonic.

Specific Indications.—Mental irritability and despondency, sexual lassitude, atony of female reproductive organs; gastric debility, anorexia, nausea, indigestion and malassimilation when due to uterine reflexes; sticky, slimy leucorrhea, atony of urinary tract, dysmenorrhea with pelvic fullness and heaviness, bearing down as if parts would fall out.

Ellingwood pronounces it a liver remedy of rare value; for dragging and weight in the male bladder; quickly overcomes phosphaturia; useful in nephritis.

It is to be regretted that the members of this valuable group of vegetable uterine tonics have only been presented to the profession in mixtures and combinations, so that the specific virtues of helonias, aletrin, mitchellia, dioviburnin, senecionin, and others have not been made out. The only attempt at such a differentiation yet made is by the eclectics; and as this is directly in line with our efforts at accurate medication, we have given the specific directions for the uses of each of these remedies as laid down by the leaders of this school. Follow these until your own observations have given you a better guide.

The dose of helonin is gr. 1-6 every two to four hours in most cases; gr. 1 four times a day when smaller doses fail.

HYDRASTINE.

Standard granules—Hydrastin, gr. 1-6, gm. .01; hydrastine, gr. 1-67, gm .001.

Hydrastin is a concentration from Hydrastis Canadensis, and contains the combined alkaloids, hydrastine, berberine and canadine.

Hydrastine is an alkaloid from the same source as hydrastin.

Hydrastine is soluble in water sparingly unless acidulated; in alcohol, ether and chloroform. Large doses slow the pulse and still larger ones cause weakness, tremors, dyspnea and incoördination. Very large doses induce clonic and then tonic convulsions and tetanus, during which respiration ceases (Cushny). The pulse slows at first from stimulation of the vagus center, then quickens as it is paralyzed, and later again slows from a direct action on the heart muscle. The vascular pressure rises from contraction of the arterioles, then falls from their relaxation and the weakening of the heart. The vasomoter center in the medulla is directly stimulated. Cushny questions the asserted action of hydrastine upon the uterine fibers, and that upon the liver. The respiration is at first faster, and besides its action on the centers it weakens and paralyzes muscular fiber of the heart. This effect resembles that of thebaine. Hydrastine is excreted by the kidneys. A cumulative action has been observed. Death from lethal doses is due to heart paralysis.

Some diuretic action is exerted.

Therapeutics.—Hydrastin has long been used as a bitter tonic. It is an astringent, gradually reducing redundant secretions. It has been employed as an injection in gonorrhea, vaginitis and leucorrhea, and given internally. For various forms of stomatitis, syphilitic, mercurial and digestive, it is an efficient lotion. Many other applications of this valuable astringent are made, such as a lotion to ulcers, fissured nipples, otorrhea, pharyngitis, and any skin disease with secretion to be dried up. Shoemaker recommended ointments in bromidrosis, carcinoma, etc.

Unhealthy ulcers, chancroids and sloughing sores are benefited by this application. Internally hydrastin has been used with benefit in gastric and duodenal catarrhs, especially of drunkards, their morning vomiting, jaundice, and enteritis, all of the chronic type. It checks the loss of albumin is desquamative nephritis. As a hemostatic it has succeeded when ergot failed; in bleeding piles, hemoptysis—where Marini pronounced it the best hemostatic—and for the hemorrhage of uterine fibromas.

As an oxytocic he found it less prompt than quinine but hastening labor and preventing hemorrhages when given for a week before confinement.

Kruse urged hydrastin for night-sweats, a full dose at bedtime. Others have confirmed this recommendation, in phthisis and other forms of free sweating.

The eclectic applications of hydrastis, as given in King's Dispensatory are numerous: The chief action is exerted upon the mucous and glandular structures, and through the hydrastine, upon the nervous system to some extent. It is valuable in disorders of digestion, functional, subacute and atonic with mucous flux; debility of mucosa; aphthous stomatitis, gastric irritability, icewater dyspepsia, gastric catarrh and ulcer, the best substitute for alcohol when stopping the use of the latter, with capsicum and strychnine; belching of putrescent gas, with sense of "goneness," preferring hydrastine in minute doses if there is great irritability; catarrhs of the intestine and gall-ducts, obstinate constipation, hepatic obstruction or congestion; convalescence from diarrhea or dysentery, in children; locally for fissured anus, hemorrhoids, ulcers and eczema of the anus, prolapsed and ulcerated rectum; catarrhal, follicular or granular pharyngitis; syphilitic ulcer of nose or pharynx, sore throat, rhinitis, ulcerated or aphthous tonsillar, pharyngeal or retropharyngeal catarrh; subacute nasopharyngeal catarrh where the mucosa are dry and parched, secretions altered in quantity and character; in catarrhal hypertrophy with profuse discharge and thickening of the membrane it has no equal; when mucus drops into the throat ditto; use locally and internally; best if with catarrhs there is muscular debility; follicular and simple conjunctivitis, corneal ulcer, ciliary blepharitis, trachoma, otitis media if free from granulations, eczema of the auditory meatus, and irritation from wax, in all which it is used locally; myalgia, when worse on pressure or motion (Webster); often reflexes from uterine, rectal and prostatic disease; reflex headaches involving the scalp muscles; pectoral tenderness from lacerated cervix; muscular pains due to hemorrhagic anemia; Schatz found it useful in hemorrhage from uterine myomas, congestive dysmenorrhea, hemorrhage in virgins even after curetting, hemorrhage from subinvolution, metritis, endometritis, parametritis, cicatrices, stenoses, and climacteric. He pronounced it too slow for postpartum hemorrhage, but good for passive forms, and for metrorrhagia. It is like ergot useful for chronic cerebral engorgements, like congestions. It has been advised for fungoid endometritis, lacerated cervix and pelvic cellulitis; leucorrheas, vaginal and uterine; gonorrhea, gleet, with thuja; incipient stricture, spermatorrhea and cystitis even with ulceration (King); cervical erosions and light papillary vegetations; scrotal eczema, acne, seborrhea sicca or oleosa, scrofula, rosacea, lupus, sycosis, boils, carbuncles and ulcers (Jeanson) when dependent on gastric

disturbance; mitigates the severity of cancer, retarding progress; in convalescence from maladies with excessive mucous fluxes or hemorrhages; or from general debility, protracted fevers, inflammations, and nervous prostration.

Specific Indications.—Non-acute catarrhs, and acute purulent otitis media, gastric irritability; irritation of parts with feeble circulation; muscular soreness worse on motion or pressure; passive pelvic hemorrhages; skin diseases depending on gastric disease.

Ellingwood says hydrastis resembles strychnine but its influence is more slowly developed and more lasting; it stimulates the respiration and circulation, imparting tone and power to the heart, and influencing blood stasis like ergot. Muscular tissue everywhere is thus influenced. It inhibits the development of superfluous muscular tissue. It increases the secretion of gastric and intestinal juices, and peristalsis. In cancer of the breast he gives hydrastis if the tumors are hard and painful, conium if small, hard and painless; phytolacca if soft or undulated, tender, with pain extending into the axilla. None of these is valuable if open; all must be long continued and applied externally also.

The text-books give the toxic actions of this drug and say scarcely anything of the effects of medicinal doses; so that one would draw from them the conclusion that it was unfit for remedial administration. As a bitter tonic hydrastis has no superior, for all the uses to which such an agent may be applied. The uses of berberine are fully described in another chapter. The concentration should be dropped out of use; and whichever of the alkaloids is indicated substituted.

Hydrastine may be ranked with the strychnine group, and Ellingwood's differentiation adopted. The writer has repeatedly noted the slowness of hydrastine in getting to work and the singular endurance of its effects. Its property of giving tone to unstriped muscular fiber renders it useful in both constipation and diarrhea when due to relaxation. It is a dryer of mucous weeping. It checks hemorrhagic oozing. When the mucosa are worn out by long-continued over-stimulation, by alcohol or condiments, hydrastine will do more than any other remedy to restore functional activity. But in the treatment of hemorrhages it has been replaced by a better remedy, in hydrastinine.

The best effects of hydrastine are obtained from small doses long-continued. Give from gr. 1-67 to 1-6 before each meal and at bedtime, for a month before deciding on its value.

HYDRASTININE.

Standard granule—Gr. 1-12, gm. .005.

Hydrastinine is an artificial alkaloid formed from hydrastine. It also forms in the plant under certain conditions, so that the galenic preparations of hydrastis usually contain some of this agent.

Hydrastinine causes little disturbance of the centers of motion and sensation, except in enormous doses (Santesson). The heart slows through stimulation of inhibition, an action analogous to that of aconitine. The arterial tension rises further than after hydrastine, and this effect lasts much longer. It does not depress the heart in medicinal doses. Cushny doubts the assertion that hydrastinine causes rhythmic contraction of the uterus and abortion. It acts solely on the uterine vessels, as on those of the rest of the body, and may cause death of a fetus by choking off its blood-supply.

Hydrastinine is soluble in alcohol, ether or chloroform, with difficulty in hot water, but its salts are readily soluble in water.

Falk concludes that hydrastinine paralyzes by its influence on the moter sphere of the spinal cord; it is not a cardiac poison; it effects vascular contraction partly by exciting the vasomotor centers but mainly by a direct influence on the blood-vessels. The rise in vascular pressure is great and persistent. The pulse slows, before death the pressure falls and death from lethal doses is due to paralysis of the center of respiration.

As compared with hydrastine, hydrastinine does not cause spinal irritation or tetanus; has no injurious local effect; is not a cardiac poison, but an excitant, and death can be prevented by artificial respiration; the blood-pressure is much greater, has no interruptions of relaxation, and is the result of a steady contraction of the blood-vessels and not due to centric irritation.

Bunge found that large doses reverse the effects of small ones, by paralyzing the vagus. Hydrastinine does not destroy the red blood cells in any doses, large or small.

Therapeutics.—The action of this agent points to its use in any affection where it is desirable to limit the afflux of blood to the abdominal and especially the pelvic organs. Permanent benefits are therefore attained in congestive dysmenorrhea, virgins' menorrhagia with no evident lesion, and in retrouterine hematocele. In endometritis and in hemorrhages from disease of the adnexa it gives temporary relief. It palliates the hemorrhage from myomas for a long time. It does not cause contraction of the uterine muscular

tissue and is useless in postpartal hemorrhages. Nor will it excite labor pains or complete expulsion of uterine contents at or before term. It is therefore not a substitute for ergot. But hydrastinine may possibly stop the hemorrhage of commencing abortion by astringing the bleeding vessels, and here it is safer than ergot.

Hydrastinine has been given with advantage for hemoptysis, continued a week or two after the cessation of the hemorrhage (Hausmann).

Overdoses have been followed by uterine pains, gastric pain and nausea, pharyngitis, and rarely indurations or ecchymoses after its hypodermic administration.

As hydrastinine lessens the irritability of the motor areas of the brain, it has been suggested as a remedy for epilepsy (Cushny).

Keyser found hydrastinine, gr. 3 to an ounce of glycerin, useful as a local application for granular conjunctivitis. Shoemaker lists several forms of skin disease in which he uses it in lotion or ointment. Rousse pronounced it effective in uterine hemorrhages, phthisical night-sweats, hemoptysis, epilepsy and nephritis; hemostatic in congestive metrorrhagia, menorrhagia, after parturition and abortion, hemorrhages from displacements or diseases of the adnexa, and during pregnancy and labor; useless in myomas and cancer. Hydrastinine acts quicker than cotarnine, but is less enduring. Hydrastinine contracts the uterine and intestinal vessels, cotarnine dilates them; the first is preferable for acute, the second for chronic maladies.

Hydrastinine increases the intestinal peristalsis and the movement of bile. It may be employed as an agent to restrain mucous fluxes when not acute. Huchard advises hydrastinine for a week preceding menstruation in cases of metrorrhagia.

The dose of hydrastinine is from ½ to 1½ grains a day, divided to suit the case. This is in serious hemorrhages; ordinary cases require about half these doses.

Reviewing the data available on the salts derived from hydrastis, it seems that all preparations of this plant might be abandoned except berberine and hydrastinine. The latter is in all cases for which hydrastine is used superior to it. The great cost of hydrastinine is the chief objection to its extensive employment; and unfortunately this seems likely to increase, as the plant is being extirpated and grows scarcer every year. English drug journals complain that the quality of the drug has deteriorated as it is no longer gathered by the Indians, and less care is taken to secure it at the season of

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greatest activity. The consequence is that the yield of alkaloids is small or wanting—a circumstance which, the journal quoted naively remarks, does not interest the preparer of galenic preparations.

HYOSCINE HYDROBROMATE.

Standard granule—Gr. 1-1000, gm. .0000625.

Hyoscine was discovered by Ladenburg in 1880. It exists in connection with atropine in varying proportions in every one of the mydriatic group of plants, but in none does it predominate, unless in exceptional specimens. For the rescue of this admirable remedy alkalometry is to be credited.

Hyoscine is a thick, syrupy liquid, but its salts crystallize. The hydrobromate is used by preference. It is readily soluble in water.

Physiologic Action.—Hyoscine resembles atropine in its effects upon the nerve terminals. The accounts of its action differ according to the purity of the article used. The pulse is slightly quickened, and the pupil dilated, some say more quickly than by atropine. Instead of stimulating the cerebrum, hyoscine causes a sense of fatigue and drowsiness in small doses, the patient moving and speaking less. In full doses sleep is produced, sometimes with a suddenness that is striking. The writer once administered a hypodermic of hyoscine gr. 1-100 to a patient, and then went out for four hours. On his return he found the patient standing exactly where he had left him, at the foot of his bed, simply having changed his posture by stooping over it, sound asleep. He had never moved. The sleep from hyoscine closely resembles the normal; the patient may be aroused if the dose is not toxic, and awakes refreshed.

The sleep lasts about 8 hours. Sometimes slight confusion or even delirium precedes sleep. When the symptoms of atropine follow the use of hyoscine there has probably been a decomposition into the former. But after full doses of the purest hyoscine, atropine symptoms are apt to follow.

Occasionally collapse has followed hyoscine. The blood pressure falls, and respiration slows. Cushny says that tolerance is produced by its continued use, but the writer has given hyoscine in doses of gr. 1-100 for seven years, and the dose had only doubled in that time. This was a case of paralysis agitans.

Even morphine and cocaine habitues have taken hyoscine as a hypnotic for long periods without increasing the dose above gr. 1-100.

Therapeutics.—Hyoscine does not act well in all cases. Where it does, as a hypnotic, it leaves nothing to be desired; but in others, doses sufficient to affect the cerebrum are followed by annoying dryness of the throat and redness of the face and neck—in fact by atropine symptoms.

Cushny thinks hyoscine less dangerous than atropine, as recovery has ensued when a dose of gr. 1-12 was taken, while 7½ grains failed to kill a small cat. But Shoemaker says hyoscine is very much more powerful than hyoscyamine, and with this we concur. The same author states that hyoscine may be used with advantage to allay the convulsions of cerebro-spinal meningitis; to check spermatorrhea; and to quiet great nervous excitement with insomnia.

Hyoscine has been recently advocated as a hypnotic in the treatment of the morphine habit. The patient is duly prepared, the morphine stopped and hyoscine administered in doses of gr. 1-200, rising if well borne to 1-50, repeated as often as necessary to keep the patient in a stupefied state till the withdrawal period has passed. The doses are given every half-hour if necessary; in fact, whenever the patient shows signs of becoming conscious and troublesome. While several good observers have reported favorably on this method, it is repugnant to the principles that should govern the treatment of these cases, and we believe is a very dangerous method.

Dr. J. A. Rawls, of Iowa, used hyoscine as a hypnotic in a case of acute alcoholic mania, sleep following the sixth dose of gr. 1-1000.

The writer has found hyoscine valuable in anemic cases, and for insomnia without fever, adding aconitine for the latter; and in night terrors, somnambulism, nocturnal convulsions, etc., when the causal indication has been met, hyoscine with cicutine hydrobromate has answered well.

Acute senile decay in an aged lady, with slow and irregular pulse and night terrors, screaming fits and suspension of assimilation and excretion—for this Fotheringham gave hyoscine gr. 1-100 by mouth in the evening, repeated in two hours when necessary, and in the morning, with an excellent recovery in two weeks. The same writer reported the success of this remedy in pneumonic meningitis with delirium, mild and severe hysteria, and delirium with rheumatic endocarditis.

Sexton reports extremely alarming symptoms from doses of gr. 1-100 which he seeks to avoid by combining morphine with it.

Hyoscine and morphine have been used as an anesthetic for cases which cannot use the volatile anesthetics. Morphine gr. 1-8 to 1-4 with hyoscine gr. 1-100 is injected hypodermically, repeated in half or one hour if necessary, and again, when usually even a capital operation may be performed painlessly, or with the aid of the merest whiff of chloroform. The method has scarcely been long enough before the profession to say the last word concerning its merits. The writer has employed it with success. Some cases have been reported where alarming symptoms followed, but to those who are unfamiliar with the action of hyoscine, its usual action may be "alarming;" and too much weight is not to be given such reports. But in general this is preëminently a drug for the small dose rapidly repeated till effect.

HYOSCYAMINE.

Standard granules—Amorphous, gr. 1-250, gm. .00025; crystallized, gr. 1-1000, gm. .0000625.

Hyoscyamine was produced by Ladenburg in a state of purity about 1880, though it had been recognized by Geiger and Hesse in 1833. According to Merck there is absolutely no difference between atropine and hyoscyamine as to effects physiologic and therapeutic. Cushny says that while the resemblance is very close there are differences. Hyoscyamine is less stimulating to the central nervous system, the garrulous delirium of atropine being replaced by the symptoms of cerebral depression, fatigue, drowsiness and eventually sleep. The slumber is more like normal sleep than that produced by morphine; the patient is easily aroused and less confused. It is by no means constant, and the atropine effects may appear instead. After atropine, sleep rarely follows. In fact, after studying Cushny's description, one suspects that he has been experimenting with uncertain and mixed samples of these drugs. While some say that hyoscyamine acts more strongly on the heart, pupils and sweat glands than atropine, others deny this.

Huesemann and Hilger say that the two differ in that hyoscyamine causes a transient dilatation of the abdominal vessels, an elevation of the abdominal temperature and a diminution of that of the rectum.

Van Renterghem divided three milligrams of Merck's white crystallized hyoscyamine into six doses, and beginning at 7 p. m., took five of these at half-hour intervals. Twenty minutes after the

first dose he felt dryness of the throat; at 7:40 the pulse became faster; at 8 redness of face and neck; at 8:30 sense of cold, light shivering; tongue and whole mucosa of mouth and throat dry, difficult to speak; at 9:00, the mucous dryness was embarrassing, impossible to insalivate any food, deglutition almost impossible, able to swallow with the aid of a little water, speech difficult, disposition to sleep, vision troubled, gait uncertain.

Excellent sleep followed, the experimentor rising twice to drink. Next day the throat was still somewhat dry, but all other phenomena had disappeared.

Therapeutics.—The consensus of experience seems to be that while hyoscyamine closely resembles atropine, the former is milder in action, less apt to cause delirium, or to increase the pulse-rate, and disposes to sleep as an ulterior effect. It has been recommended in paralysis agitans, senile and mercurial tremors, neuralgia, acute mania, chorea, delirium tremens, and epilepsy; in small doses it is narcotic and calmative; for vesical tenesmus, the delusions of persecution, spasmodic cough, laryngismus stridulus, hiccough, and whooping-cough. In all these hyoscyamine should be administered in very small doses, repeated every five to sixty minutes, till the first indication of its action is manifested in dryness of the mouth or throat, and immediately suspended; as there will be no benefit derived from pushing the remedy beyond this point. It is best given in hot solution to secure the quickest effect. The dose of the amorphous alkaloid for such cumulative dosage is gr. 1-1000; and many persons will be found who cannot take the granule gr. 1-250 without unpleasant effects.

In alienist practice hyoscyamine has been found useful in aggressive mania, chronic forms with hallucinations, subacute and recurrent mania, the irritative stages of general paralysis, and in epilepsy. Maniacs who tear their clothes quit this quickly and for a long time after some doses of hyoscyamine. Some have prescribed it with success in mania with periodic irritation, and in circular mania. Seguin preferred it to chloral in delirium. Sepilli and Riva found the access and gravity of epileptic seizures diminish under its influence. Kretsch advised against its use when hallucinations of vision were present. Lawson and Doerrenberg advised hyoscyamine for retention of urine and coprostasis of the insane, but Von Schroff preferred atropine here.

As an anodyne hyoscyamine has been employed largely. Oulmont injected it for neuralgias, tetanus, trembling paralysis, tremors

of old age and of mercurialism, with complete success. Millican gave it for hepatic colic, perityphlitis and asthma; Von Schroff as a calmative for coughs.

In America hyoscyamine has assumed an important role as a combined analgesic and antispasmodic. In the very numerous cases in which pain of a spasmodic form is to be conquered, this is the first of remedies. In the atrocious pangs of gall-stones and urinary calculi, in all forms of colic, hyoscyamine has wholly replaced the less efficient and more dangerous morphine. Here full doses are needed, and glonoin is added to open the blood-vessels and secure prompt effect, with strychnine arsenate to steady the affected nerves, and this triad forms probably the most generally applicable anodyne-antispasmodic in our possession.

Abbott has placed hyoscyamine before the profession as a remedy for various forms of intestinal obstruction, such as impaction of feces, and strangulated hernia. Before resorting to prolonged and painful efforts at reduction, give a full dose of this agent, enough to produce redness of the skin, and in a few hours it will often be found that spontaneous reduction has followed the relaxation of the spasm that held the bowel imprisoned. The treatment of impaction, and of all but the suppurative forms of appendicitis, of perityphlitis, etc., by hyoscyamine has been advocated by Dr. Zophar C. Case, who has published series of cases that would convince anyone but a bigoted adherent of the "no treatment but the knife" creed. The truth seems to be unknown to these gentlemen that in many cases the obstruction is spasmodic, and hence amenable to this potent remedy. These uses of hyoscyamine have rendered it one of the most important agents in our armamentarium. Between it and atropine the choice is generally a matter for individual preference. Possibly the anodyne effect of the latter is less pronounced.

Children take larger doses of hyoscyamine than adults, proportionally. Van Renterghem gives newborn infants one-eighth of a milligram at a dose, or about gr. 1-500. This seems a huge dose, and we suspect that this author has a weaker hyoscyamine than that used in American practice. Certainly his doses for adults, gr. 1-134 every quarter-hour, cannot be employed here. But Prideaux gave six milligrams—gr. 1-11—in acute mania; and Lawson 8 milligrams—gr. 1-8—in general paralysis of the insane. Seguin gave 50 milligrams at a dose in chronic mania—equal to gr. 5-6. The purity of the drug employed may well be questioned.

Poisoning with hyoscyamine is to be treated exactly as that from atropine.

Many other applications of hyoscyamine have been reported by American advocates of alkalometry. Thus Fretz met a case of delirium with retention of urine in typhoid fever. The patient would have required an anesthetic to permit catheterization. Hyoscyamine was given every fifteen minutes, and five doses relieved.

W. L. Day reported a case of gastric cramps where morphine had failed to give relief. Three doses of hyoscyamine and strychnine arsenate removed the difficulty.

George Mott gave hyoscyamine with codeine for thoracic neuralgia with bronchitis, relieving the pains and causing curious hallucinations of sight and hearing. H. I. Terpening reported the case of an aged paralytic with attacks of dyspnea and tremor, quickly relieved and cured in three weeks by hyoscyamine.

IODOFORM.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Iodoform, CHI_3, may be prepared by heating sodium carbonate, alcohol, water and iodine together. It occurs in yellow, shiny scales, soluble in alcohol and in ether but almost insoluble in water. It contains 96.68 per cent of iodine, combined with the carbon firmly enough to resist everything short of decomposition of the molecule, yet broken up by solar light. In the animal body iodoform is decomposed, and eliminated by the kidneys, skin and lungs, in the form of iodine salts and a little undecomposed.

Taken internally or applied to open surfaces, too long or in too large doses, symptoms of intoxication appear. These begin with a sudden acceleration of the pulse and slowing of respiration; the temperature rises at first, then sinks later; nausea, vomiting, anorexia, diarrhea, follow. These disappear if the remedy is suspended. If not, grave disturbances occur, excitement, insomnia, coma, hallucinations of persecution, mania, convulsions, and on recovery the memory may be weak. There may be continual anorexia with albuminuria and tube casts. A harmless exanthem and purpura may appear. The symptoms may persist for weeks, and end in death from heart paralysis, or a grave meningo-cephalitis.

Advanced age predisposes to iodoform intoxication, and the remedy must be employed, if at all, with great caution in such persons.

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Iodoform does not destroy the vitality of the tubercle bacillus, nor does it influence bacteria in general. The theory as to its unquestioned beneficial action is that it strengthens the affected cells, in resisting the parasitic invasion—a theory unsatisfactory to those who have noted most closely the effects of iodoform in tuberculosis. No known decomposition product of iodoform exerts as beneficial an action.

Therapeutics.—Externally iodoform is used as a healing, anodyne and antiseptic dressing. For chancroids it has probably no equal. Old ulcers often refuse to heal because the sensory nerve terminals are exposed; and prompt and decided benefit results from the application of iodoform ointment. Irritable ulcers, such as frequently appear in the mouth, are quickly relieved and heal promptly when iodoform is applied—best in scales, not powdered. The pains of ulcerated cancers are relieved by it.

Internally iodoform has been employed extensively in the treatment of pulmonary tuberculosis. It soothes the cough and causes improvement in the affected region, but just how is unknown. It was supposed to combat the bacilli directly; then that it disinfected the pulmonary tract, or interfered with the development of some of the bacteria concerned in the work of destruction; but as with the *modus operandi* of internal antiseptics in general, the more they are studied the more difficult the problem becomes. The truth is, our knowledge of the physiologic functions is too superficial to base upon it much of value as to the true action of remedies. Too often we must content ourselves with the knowledge that certain beneficial effects follow the use of a remedy, without being able to explain how the results are produced.

But when given to patients with pulmonary consumption of all grades iodoform brings about a general improvement, the cough moderating, the sputa healthier, and the disease processes apparently ameliorated. J. Solis-Cohen said that from iodoform he had obtained more benefit than from any other in treating this malady. Chauvin and Jorissenne praised it as a remedy for hemoptysis.

Iodoform has been recommended as a remedy for neuralgia, catarrhal jaundice, the early stages of hepatic cirrhosis, syphilis, to check gastric fermentation, for dysentery, diabetes, tenia and ascarides. In fact, iodoform has been urged as a useful form for the introduction of iodine into the system; but except in tuberculosis this can better be accomplished by the use of iodized calcium or the iodides of mercury, iron, arsenic, etc.

Shoemaker suggests the following test for approaching iodoform intoxication: Mix a few drops of urine with calomel, by a glass rod, on a white plate; if iodine is being eliminated in dangerous quantities there is produced a well-marked yellow discoloration.

No application appears to have been made as yet of the power of iodoform to increase the thyroid secretion. The same is true of Binz' discovery that iodoform hinders the diapedesis of leucocytes.

Iodoform has been advocated as an intestinal disinfectant, but there are other and more reliable agents, less dangerous.

F. Warren Lanoix found that the headache affecting miners from the fumes of blasting powder was quickly relieved by inhaling the iodoform from a bit of gauze.

Iodoform should be given by the intensive method. The dose should not exceed gr. 1-6, and for very susceptible patients the granule of gr. 1-67 should be used. One of either may be given every hour or even oftener, till the patient begins to taste or smell the drug, which is an evidence of saturation, when it should be discontinued or given in smaller doses or less frequently. Tuberculous patients evince a remarkable tolerance for iodoform, and the writer has given fifteen grains a day to these patients; but it is better to use europhen, which is less apt to part with its iodine and cause toxemia. Some persons evince an idiosyncrasy against all the iodic compounds, and this may even be hereditary. The writer once applied a very small dusting of europhen to an anal fissure and next day an intertrigo had developed that took off the epithelium from the umbilicus to the knees. The daughter of this patient was similarly affected by the same agent; and both proved refractory to all forms of iodine, locally applied.

IRIDIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-12, gm. .005.

Iridin is a resin derived from the Iris versicolor, or blue flag.

Felter and Lloyd attribute the virtues of iris to the oil, which forms a constituent of iridin.

The same authors say that iris acts upon the gastrointestinal canal, the glandular and nervous systems; powerfully exciting the biliary, salivary and pancreatic secretions. It causes violent acid vomiting, frequent hydragog catharsis, intestinal burning and severe colic. After fatal doses, marked gastrointestinal congestion

found. It has produced neuralgia of the face, head and extremities. It causes salivation but without injuring the gums or the teeth. It is alterative and cholagog, one of the best agents to influence waste and repair, exerting a powerful catalytic action upon the lymph glands, the ductless glands, the liver, pancreas and kidneys. It does excellent service in cachexias, bad blood, scrofula and mercurialism; and in secondary syphilis with cerebral disturbance and coppery skin is one of the best remedies. For biliousness it is prompt and efficient; for bilious headache with nausea and bitter vomiting, or sick headache from indigestion it is unsurpassed. Other conditions for which Felter and Lloyd recommend this agent are: Chronic hepatitis and other hepatic affections with constipation and sharp, cutting pains increased on motion; duodenal catarrh with jaundice and clayey stools; constipation from torpor; in minute doses for gastric irritation in cholera infantum and morbus; diarrhea and dysentery with large, slimy evacuations; gastralgia; aphthae; reflex muscular pains from gastrointestinal or pancreatic disorders, especially when the muscular coats of the viscera are affected; pectoral and subscapular pains; soft, glandular enlargements; goiter or enlarged thyroid—one of the few reliable drugs here—whether constant or menstrual; ovarian and uterine disturbances with goiter (use internally and locally); exophthalmic goiter in early stages; improves Addison's disease; chronic pancreatic diseases with sodden, lead-colored tongue, chronic splenic disease with white skin—leucocythemia; chronic renal diseases, ascites, anasarca, hydrothorax, hydropericardium (in dropsies given in cathartic doses, with ginger, piperine or camphor); uterine hypertrophy, enlarged ovaries, ulcerated os and cervix uteri, uterine leucorrhea and dysmenorrhea, especially with impaired health, mental depression and pigmented skin; chronic and syphilitic rheumatism, gonorrhea, spermatorrhea and prostatorrhea and nocturnal emissions from masturbation, with debility, mental uneasiness and centric nervous irritation; syphilitic iritis (Scudder); malarial jaundice, intermittent and bilious remittent fevers, with euonymin; for vomiting of pregnancy iridin 3 gr. at bedtime with a saline in morning; comedones and other skin affections of youth, chronic, with genital disorders, rough greasy skins; full thyroids in women; syphilides, eczema rubrum of children and capitis of adults, zoster and herpes preputialis, with rhus; rupia and impetigo with sulphur or arsenic, lepra; pustules on head in children; in all cases associating other indicated remedies.

Specific Indications.—Thyroid fullness, enlarged spleen, chronic hepatic disease, with sharp, cutting pain worse on motion; nausea and vomiting of sour liquids or regurgitation of food, after rich pastry or fats; watery, burning stools; enlarged lymphatics, soft and yielding; rough, greasy skin with sebaceous disease; menstrual wrongs with large thyroid; unilateral facial neuralgia; wasting muscles and other atrophies, and bad blood.

Ellingwood says iris promotes waste and elimination of effete material from the blood. It will prove serviceable when the stools are clayey, urine scanty, skin inactive and jaundiced; digestive irritations with altered secretions; neuralgia over right eye; acid nausea with gastralgia, after rich food; burning diarrhea; cholera morbus with violent umbilical pain, serous stools and great depression. Henson says only the green root preparations are active. These rival phytolacca in their beneficial effect on diphtheria and tonsillitis.

He pronounces it a mild hepatic stimulant, with an especial curative effect on the stomach resembling that of sodium sulphite. It acts on the pancreas, a power shared only by iodine, mercury, and perhaps mandrake and cinchona. The key to the use of iris is when the spleen and pancreas are affected as well as the liver, with sour stomach, vomiting acid or yeasty half-digested food an hour after meals. If the liver is also torpid add podophyllin; for constipation, aloes for men, juglandin for women; or cascara. If the whole alimentary canal needs toning, give hydrastine, which will relieve the diarrhea.

Van Renterghem took Merck's iridin up to doses of a gram, without much effect. But this is one of the remedies that requires bile to develop its activity; and the small granules made with inspissated oxgall are active. Ellingwood gives the dose of the oleoresin as one to five grains. The eclectics employ specific iris in doses from a fraction of a drop up to five drops. They do not employ iris as a cathartic. For chronic cases it seems best to give small doses, gr. 1-67 to 1-6 before meals and at bedtime, increasing as may be indicated, and watching the stools for the effect, rather than the large irritative doses.

IRON.

Standard granules—Iron arsenate gr. 1-67—1-6, gm. .001—.01; iron iodide gr. 1-12, gm. .005; iron phosphate gr. 1-67—1-6, gm. .001—.01; iron valerianate gr. 1-6, gm. .01.

Cushny says that iron is probably essential to all forms of protoplasmic life. Small doses of persalts of iron have an astringent

taste; in larger doses they cause pain and nausea, vomiting and even purging. The gastrointestinal disorder may be so severe as to occasion collapse. The prolonged use of iron causes dyspepsia, constipation and colic, if the iron collects in the bowel in the form of sulphide. Blackening of the teeth may be caused by the acid present, by the formation of iron sulphide, or by the union of tannic acid from the food with the iron. Iron increases the secretion of hydrochloric acid (Buzdygan). The salts of iron with organic acids hinder digestion more than the salts with inorganic acids, ferric salts more than ferrous, and the insoluble salts the least of all. The digestion of starch is scarcely affected by iron. Given by the mouth iron induces leucocytosis (Pohl), and does not affect the renal excretion of double sulphates, hence has no intestinal antiseptic action (Moerner).

When the double salts of iron are injected into the blood, they occasion toxic symptoms, disturbed respiration, gastrointestinal disturbances, casts and albumin in the urine, the postmortem showing the gastrointestinal mucosa congested with extravasations, the kidneys also congested. In acute poisoning the alkalinity of the blood is reduced by the lactic acid formed. The effect on the central nervous system is depressing, to paralysis, but this may be due to the gastric effects. Very large doses dilate the blood vessels. The astringency is due to the precipitation of proteids.

When iron is injected into the blood about 2 to 5 per cent of it reappears in the urine, the rest being stored up in the liver and spleen, and possibly in the marrow, whence it is slowly taken by the various tissues, and excreted by the mucosa of the large bowel. Iron is absorbed by the duodenal mucosa, carried along the lymphatics to the blood, stored in the spleen, taken through the portal blood to the liver, stored there for a longer time, and slowly distributed through the blood, finding its way out through the large bowel. Nothing is known with certainty as to the form in which iron is absorbed. It passes through the thoracic duct to reach the blood. While there is usually plenty of iron in the food, there is decided benefit from the administration of iron as medicine. This is explained on the theory that the food iron is so enveloped in colloids that its absorption is hindered.

Therapeutics.—The presence of iron in the blood and every tissue, sufficiently justifies its use as a nutrient tonic. When given in proper remedial doses iron increases the appetite, stimulates the digestion, tends to check diarrhea if present and to constipate if

not. The blood improves in quality, the color freshens, the eyes brighten, and the pallor of anemia gives place to the rosy hue of health. When the smallest doses of iron are given, most of it appears in the blackened stools. Very little is absorbed, and this has led some to recommend doses too small to cause this blackening. But experience has shown that a certain percentage of the daily dose is absorbed; and that if the dose is increased to the full tolerance, the same percentage of this larger dose will still be absorbed. Hence the rule promulgated by Niemeyer, in cases of chlorosis, to give all the iron the stomach will bear; and the results of this medication he pronounced the most brilliantly successsful in the practice of medicine. But when iron is thus given there is a tendency for large quantities to accumulate in the bowel in the form of an insoluble sulphide, and this may cause obstruction or ulceration. This may be prevented by administering every two or three days a dose of some saline cathartic, sufficient to clear the bowels of the ferruginous accumulation.

It has been found that when Nuclein solution is given at the same time as iron, the proportion of the latter that is held in the body is increased.

Iron is useful in all cases of anemia, whether essential or due to organic disease, with exceptions to be hereinafter noted. It thus relieves many affections that depend upon anemia for their presence, such as amenorrhea, neuralgia and various neuroses, dyspepsia, etc. When there is a cause of the anemia evident it is of course to be treated as well; and neglect of this simple rule is the reason many persons improve while taking iron and drop back when it is discontinued. Thus, if the anemia be due to constipation and fecal absorption, it is folly to give iron without at the same time regulating the bowels.

Iron is thus given for anemic dropsy, in convalescence from fevers, the cachexias of malaria, syphilis, mercurialism, chronic diseases. In asthenic erysipelas the tincture of the chloride of iron has done the greatest good of any remedy the writer has ever employed, when given in full doses—a dram every four hours—but in the sthenic form it is worse than useless. The perchloride is the most effective of the local astringents.

Iron in small and frequent doses is efficient for passive hemorrhages, and when postpartum bleeding has been reduced to a dribble which yet resists ergotin. But diathetic bleeding is increased by iron, and in some cases postpartum hemorrhage will continue as

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long as iron is given. When hemorrhage continues from anemia, it is wise to give the salts of lime to restore strength to the blood-vessels and then the iron will accomplish its duty far better.

In desquamative nephritis iron has been largely given, the use of Basham's mixture being a routine with many practicians. The writer has never known of benefit from it; though the anemia resulting from this malady may be benefited by iron provided elimination is perfectly unobstructed. Otherwise iron is apt to do harm.

As iron increases the excretion of urea and the frequency of micturition, it deserves to rank among the diuretics; but this power has only been utilized in treating the dropsies of anemia.

Smart says the sulphate is the best chalybeate to increase the number of the red blood corpuscles and their hemoglobin, the carbonate ranking next and the chloride third. But much depends on the mode of administration.

Shoemaker mentions as adapted to the use of iron, subacute and chronic eczema with anemia; pseudoleukemia, acute rheumatism in anemics, to alternate with mercury in debilitated syphilitics, chorea (iron bromide), gonorrhea, leucorrhea, tuberculosis, anemic hysteria with amenorrhea, for neurasthenia with palpitation of the heart, anemic puerperal mania and that of lactation; rachitis; profuse mucous discharges, dilatation of the stomach, thread worms, emphysema and phthisis; fatty and dilated heart; nocturnal incontinence of urine; spermatorrhea with relaxation and anemia; vasomotor disturbances of the menopause.

The contraindications for iron are: Plethora, the apoplectic tendency, hypertrophy of the heart; acute fever, of the sthenic type especially; active hemorrhage, and the hemorrhagic diathesis; florid phthisis, where the use of iron was shown by Trousseau to induce hemorrhages from the bronchi; active gastric catarrh, and acute affections of the stomach or intestines, which are made more active by iron.

When persons long anemic have their blood improved by iron, they are apt to suffer from headache, the brain having been accustomed to the thin blood. This may be prevented by giving iron bromide, or by a little hydrobromic acid. Usually all that is needed is to keep the bowels free and aseptic.

When the object is to improve the blood as quickly as possible, it is best to keep some iron ready for the absorbents constantly, by giving quite small doses very frequently. Of iron phosphate gr. 1-6 may be given every half-hour during the day, and this dose may

be increased to a grain if well borne. Much more will be tolerated and absorbed in this way than by the old routine of three doses a day.

In the long list of chalybeates there is room for endless variations as to combinations with other salts, and individual tastes, conditions and idiosyncrasies. Numberless attempts have been made to establish the superiority of some one or other salt of iron, on the score of assimilability, etc., but investigation has invariably disproved these claims, and shown that all iron salts and preparations are useful in the treatment of anemia. Even iron filings have proved beneficial; and the scales scattered from the smith's anvil. The best preparation is that which best agrees with the taste of the patient and disorders his digestion least, and hence can be given in the largest doses.

All the tonics are synergistic to iron, as well as the whole tonic regimen of cold or salt baths, high feeding, open air, mountain or sea-shore, exercise, etc.

IRON ARSENATE.

For the uses to which iron is put as a reconstituent tonic, the arsenate is undoubtedly the best of the chalybeates. While iron is an antidote for arsenic, acting by rendering the latter insoluble, this insolubility is not absolute but relative, and prompt evacuation of the stomach must follow the use of the antidote.

Burggraeve pronounced iron arsenate the reconstituent of the blood, *par excellence*. "The blood is a *milieu* from which all the tissues draw the elements for their reconstitution. In cancer, tubercle, scrofula, it prevents the development of morbific germs while favoring the transformation of white cells into red. Looking on pathologic elements as physiologic elements diverted from their true place, we may hope to return them by amending the nutritive processes. This is what iron arsenate does. In squamous skin diseases, lichens, psoriasis and lupus, it is necessary to modify by a powerful nutrition, a fertilized soil, the renovation of the epidermic cellules. Here it is still the blood which should be improved. And who can say that it is not the elementary white globules of this liquid that furnish the innumerable cellules constantly in the way of formation and transformation? There is always the formative nisus, vitality; but if the material does not possess the spontaneity of evolution, the life cannot abstract itself from the matter."

For anemia with weak heart and oedema he associated iron arsenate with digitalin, to rapidly reëstablish the normal respiratory and circulatory rhythm. He also employed this agent for the chloroanemias due to delay of establishing menstruation, in the purulent cachexia, etc.

Hare recommends iron arsenate in anemics with dry, scaly skin diseases; and in the anemia of chronic diarrhea.

The dose is gr. 1-67 to 1-6 before each meal, or the smaller dose every half-hour while awake. It is well tolerated.

IRON IODIDE.

Iron iodide is remarkable from the fact that both the elements contained in it exert their effects at the same time, though these are to some extent antagonistic. It is especially suited to cases of scrofula, where there is need for stimulating the destruction and removal of morbid material and rebuilding healthier tissue at the same time. The iodine in this combination is very active, and care must be taken that overdosing does not occur. The first intimation of irritation of the eyes or nose, coryza, sneezing, should be the signal for lessening the doses or suspending the remedy. It is best given to adults in doses of gr. 1-12 every two hours.

In anemic syphilitics this is also a useful remedy, and may be given with the iodides of mercury, arsenic and lime. It has been used to some extent also in non-pulmonary tuberculosis, and in amenorrhea with lymphatic enlargements.

IRON PHOSPHATE.

Iron phosphate is well suited to any of the uses of iron for which the arsenate is undesirable. Whether the phosphoric acid combined is useful in any given case or not, it is at least harmless.

IRON VALERIANATE.

This preparation unites with the properties of iron those of an antispasmodic and nervine. It possesses the powers of valerian in sustaining the nerves and comforting the afflicted which render that remedy so valued.

JALAPIN.

Standard granule—Gr. 1-67, gm. .001.

Jalapin is a resin from Ipomoea Jalapa. This resin contains two glucosides, convolvulin and jalapin, the latter in small quantity. It is a drastic hydragog purgative in large doses, requiring bile to develop its activity. Full doses produce stools in two hours, with

much pain and griping. Toxic doses cause acute enteritis, bloody stools, with a less degree of gastritis, as evidenced by nausea and vomiting. But moderate doses are less apt to cause griping than the aloes group. Jalap is a local irritant to the skin and mucosa.

Jalapin increases intestinal peristalsis and is well suited to cases where hard scybala form. As a purgative to clear the bowel at the beginning of treatment of fevers jalapin is suitable; also as a derivative in cerebral congestions and similar states of the spinal cord. As to dropsies it is now well comprehended that the weakening from hydragogs more than counterbalances the benefit derived from the excretion of fluid. There are better and safer ways of accomplishing this object.

Jalapin like all purgatives is contraindicated in acute intestinal irritations and inflammations, menstruation and pregnancy, collapse. asthenia and anemia; and in cystitis those which act on the lower bowel should be avoided. Dissolved in glycerin from one to three drams, jalapin acts effectually when injected into the rectum.

Shoemaker recommends jalap in congestion of the lungs with distended right heart, lividity, short breath and cardiac asthma.

Felter and Lloyd recommend jalap in inflammations of the biliary apparatus; costiveness, hemorrhoids; taken before meals as a remedy for excessive appetite, to hasten expulsion of worms.

Specific Indications.—Costiveness; pain and griping in lower bowel; colic with stercoraceous vomit; general gastrointestinal torpor.

As a cathartic jalapin is only employed in combination with other drugs of this class. Given in the small doses of gr. 1-67 every one to three hours it excites peristalsis and intestinal secretion and thus relieves costiveness and habitual constipation. But unless carefully dosed and the influence of habit is established, the doses must be increased and the effect is not curative. As a cathartic for prompt and free action the dose is two to five grains; best given with a full dose of potassium bitartrate. It then acts in two hours. Given in glycerin by enema the dose is one grain.

Van Renterghem recommends gr. 1-3 every hour for an adult.

Burggraeve advised gr. 3-67 hourly in chronic enteritis.

JUGLANDIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Juglandin is a resin from the root bark of Juglans cinerea, the common butternut. That employed by French dosimetrists is from

Juglans regia, and is probably identical. As supplied by Merck, it is in the form of a brownish powder, of a saline and slightly bitter taste, little soluble in water, freely in alcohol, not at all in ether.

Juglandin possesses the virtues of the astringent aromatic bitters. It is a mild stimulant to the alimentary canal, laxative, in larger doses gently cathartic, causing no griping or subsequent weakness of the intestine (Felter and Lloyd). It closely resembles rhubarb in stimulating the gastrointestinal secretions but does not have the subsequent constipating action so markedly. The above authors recommend it in colorectitis, habitual constipation and other intestinal affections; atonic dyspepsia, indigestion with sourness and flatulence; tenesmic burning, fetid diarrheas and dysenteries, and intestinal indigestion with irritation; scrofula and chronic skin diseases with vesicles or pustules; as a cathartic in rheumatism and chronic respiratory affections; lumbago, intermittent and remittent fevers with abdominal congestion; murrain and yellow water of horses.

Specific Indications.—Chronic constipation, gastrointestinal irritability with sour eructations, flatulence and either diarrhea or constipation; diarrhea and dysentery with tenesmus and burning fetid discharges; torpid liver; chronic pustular or vesicular skin diseases freely discharging; eczema.

Ellingwood says it influences with great energy the liver, small intestines, colon and rectum, increasing the formation and flow of bile, and the activity of the intestinal glands. It closely resembles iridin. He considers juglandin valuable in duodenal catarrh, with torpid liver and jaundice, in small doses in dysentery and bilious diarrhea, and in intestinal diseases with irritability, hyperemia and tendency to inflammation; chronic constipation if dependent on defective elimination of bile, the stools clayey and dry; eczema, herpes circinatus, impetigo, pemphigus, rupia, prurigo, molluscum, lichen and chronic scaly affections; mucous irritations of throat, eruptions like scarlatina, *noli me tangere,* scrofulous glands, congestion and irritation of the respiratory and gastric mucosa; nursing sore mouth, mouth ulcers with constipation; used locally and internally for chronic ill-conditioned ulcers, stimulating waste and improving nutrition.

How much of the effects of this remedy as above described may be summed up in the remark that it clears out the fetid contents of the bowel, stimulates a healthier secretion of the alimentary fluids throughout, and thus puts a stop to the toxemia resulting from the

absorption of poisons from the alimentary canal. The eclectics have made many true observations as to the uses of such remedies, but they seem to have totally failed to explain their effects, or to grasp the principle that explains their pathology, and the success of their therapeutics.

Van Renterghem found he required two to three centigrams twice a day—gr. 1-3 to 1-2—to produce a purgative effect. Besides its purgative qualities he credits juglandin with special value in scrofula, the syphilitic cachexia, the mercurial dyscrasia, chronic intestinal catarrh, and helminthiasis. Used after mercury it is certainly beneficial, without possessing any specific control over syphilis (Pearson). Even here it is the digestive difficulties that are remedied by juglandin and that constitute the indication for its employment (Posner). Droixhe counted on curing 75 per cent of scrofulas with this agent; which acted mildly, with few relapses; the effects were slowly manifested, especially with non-suppurating glands; the local effects of the leaves being more decided than the internal administration; especially did he urge it as the best treatment of scrofulous ophthalmias.

Van Renterghem advises doses of gr. 1-3 to j four to five times a day. It may be associated with santonin for worms, mercury for syphilis, or with other cathartics.

KOUSSEIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Koussein is a resin derived from Brayera anthelmintica, a tree of Abyssinia. It is yellowish white, partly crystalline, disagreeably bitter, almost insoluble in water, quite soluble in stronger alcohol and in ether, ammonia and caustic alkalies. Two alkaloids have been found in kousso, one of which is a dangerous paralyzant of the peripheral muscles and those of respiration, but neither has been studied closely. Kusotoxin also paralyzes the heart. It causes dyspnea, rapid breathing, salivation and vomiting. In large doses kousso causes diarrhea and increases the urine. It seems to be a general protoplasmic poison (Cushny). Given in pregnancy kousso is liable to cause abortion.

All varieties of tape worm and the lumbricoid also, are destroyed by this agent. Kuechenmeister found that they died in half an hour when placed in a milky infusion of kousso; in two or three hours in an albuminous mixture. The maceration renders it difficult to detect the head of the worm.

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Jack found that a dose of 1-2 ounce caused a sensation of emptiness of the stomach, slight nausea, fatigue and dislike of work, then gurgling in the bowels, and after an hour and a half many copious stools, solid, then liquid. There was no headache nor vomiting, pains in the stomach or difficulty in urinating, symptoms often presented by those who have taken doses of six drams (Hasse, Petit).

Van Renterghem says koussein acts even against ascarides. He advises never to give a tenicide unless the sections of the worm have been passed and are recognized by the physicians as such. Of the granules containing gr. 1-6 each he gives an adult ten every quarter hour, beginning at 6 a. m., and after the fourth dose administering a dose of castor oil. This is to be repeated till the tenia has been expelled. For ascarides, in children under two years of age, he gives gr. 1-3 each of koussein and santonin, during the day. For older children give larger doses. Begin each day with an intestinal lavage with saline. Juglandin should be added if there are evidences of scrofula.

Somewhere we have read that in Abyssinia where tenias are considered a matter of course, kousso is only taken as a means of disciplining the parasite when he becomes troublesome, not with the intention of destroying him. In America the use of koussein has been almost entirely replaced by that of male fern.

LECITHIN.

Standard tablet—Gr. 1, gm. .065.

In 1895, Danilewsky made the startling discovery that lecithin, administered to growing animals, was capable of stimulating their growth. He administered this substance to three young rabbits, all of the same litter, keeping three others as controls, that is, giving these no lecithin. He found that the animals treated with the lecithin grew nearly twice as fast as those that had not been so treated. This discovery created a tremendous sensation at the time and was largely responsible for the latter-day revival of organotherapy.

In the use of lecithin we have a true substitution treatment; for, by giving this substance, we supply something to the organism that is lacking in many morbid conditions. Its administration, therefore, is indicated on the same grounds (in the conditions to be enumerated below), as the administration of thyroid preparations in myxedema and cretinism.

Though discovered many years ago, lecithin for a long time commanded only strictly scientific interest. This was due to the fact

that it could be manufactured only in very small quantities and by a very complicated process, and that the chemists who experimented with this body were laboratory workers and not clinicians.

A number of so-called "lecithins" have been made from the yolk of eggs. Unfortunately, it appears that these are therapeutically not so active as the lecithin made from animal tissues; the explanation that can be ventured is, that, lecithin, as found in the egg, is really an inert storage body, not meant to be utilized until the chick embryo begins its life processes, whereas lecithin made from animal tissue (properly, as in Neuro-Lecithin, Abbott, from nervous tissue), represents a product that is living at the time the animal is killed, and does not die with it.

Lecithin is universally distributed throughout the organic world and is found wherever protoplasm is alive. It occurs in nature always combined with certain albumins, and in order that it be properly assimilated it must be isolated from its albuminoid combinations. If this were not necessary it would be a very simple matter to administer lecithin in the form of yolk of egg or of brain substance. As a matter of fact, some of the lecithin preparations on the market are nothing more than emulsions of yolk of egg. Needless to say these are therapeutically inert.

In administering lecithin, we administer phosphorus in true organic combination. It has been the aim of therapeutists, for a great number of years, to find a phosphorus compound that is easily assimilated and properly retained by the tissues, the reason for this endeavor being that in all wasting diseases, in neurasthenia and nervous debility of all kinds, there is always a great loss of organic phosphorus. It may be considered a clearly recognized postulate that unless this phosphorus is replaced the organism cannot perform its functions in a normal manner.

At first, basing their therapy on this idea, clinicians gave certain inorganic salts of phosphorus as, for instance, sodium phosphate and later the hypophosphites of sodium; then certain French physicians, recognizing that in lecithin the phosphorus is found combined with glycerin, introduced the so-called glycerophosphates into practice; but all these phosphorus compounds have proved, practically, to be therapeutic failures and have since been abandoned by conservative therapeutists, although some, unthinking, adhere to their old-fashioned prescriptions even to this day.

In lecithin a phosphorus combination has at last been found that

is readily assimilated and that can be used to supply phosphorus to starved nerve tissues whenever they cry for it.

Therapeutics.—The clinical results that are based on the experimental investigations with lecithin are exceedingly gratifying. Aside from the fact that given to normal infants and adolescents, it unquestionably hastens their growth and stimulates more rapid development, it is an understood fact that, given to abnormal children, and to those suffering from marasmus and malnutrition, it (Neuro-Lecithin, Abbott) reëstablishes nutritive equilibrium, favoring growth and stimulating normal development.

In a great variety of nervous disorders, in which there is loss of nerve energy, it acts as a reconstructor of nerve tone and is therefore exceedingly helpful.

In anemia and chlorosis, it stimulates the function of the blood-forming organs, and is therefore indicated.

In a large variety of functional disorders of the nervous system and in those disorders of metabolism that are the inevitable result of these nervous perversions, lecithin acts with remarkable efficacy; thus, in diabetes, and in the uric-acid diathesis, both diseases that are presumably due to some neurosal defect, it has been given with advantage.

In neurasthenia and in a variety of psychoses, usually classed as "nervous prostration," lecithin has also been most successfully employed.

There is one other disease, in particular, in which lecithin has been found to be of great value, namely, tuberculosis. In this affection there is always great loss of phosphorus and nitrogen, owing to the destruction of the patient's tissues by fever and the tuberculosis toxin. This loss, it appears, can in many cases be replaced by the administration of lecithin in sufficiently large doses; for it stimulates tissue-reconstruction and incidentally supplies the needed phosphorus. Many clinicians report really brilliant results from the administration of this preparation in the treatment of the early stages of tuberculosis, and it is tentative at any stage.

Lecithin also has the power of stimulating leucocytosis and this, it is clearly recognized, is the best and most efficient means of combating any acute infectious disease; and in convalescence from acute infectious diseases there is no tissue-builder, no general tonic, like it —alone or synergistic to the Triple Arsenates with Nuclein (devised of other indicated vital incitants).

It is also said to be a most efficient remedy in functional im-

potency and in premature senility. Lecithin is, therefore, a practical panacea at both extremes of life, stimulating the young organism to growth and preventing premature decay in the old.

LEPTANDRIN.

Standard granule—Gr. 1-6, gm. .01.

Leptandrin is a resin from Leptandra Virginica, or Culver's root. Lloyd states that the ordinary leptandrin is inert, the hydro-alcoholic extract alone carrying with it the virtues of the plant.

Lloyd says that leptandra acts upon the stomach, liver and intestines; the fresh root causing dangerous catharsis, emesis, dysentery, vertigo and in pregnant women miscarriage. On drying it becomes a safe and reliable cholagog, laxative and cathartic. In small doses it does not physic but gently stimulates the liver and the functional activity of the whole intestinal appendages. It favors normal intestinal excretion and improves digestion. Scudder used it as a gastrointestinal tonic, for feeble circulation with stasis. It acts well in intestinal atony, hepatic torpor, the early stages of fevers and dysentery, and chronic dysentery and enteritis with dizziness, cold extremities, headache, abdominal and hepatic pain with mental depression. Stimulating the glandular system to activity it is useful in chronic catarrhs; for indigestion with deficient secretion adding podophyllin, for acholic stools even if there is diarrhea; dyspepsia with frontal headache, yellow tongue, nausea, jaundice; for gastric atony combining with hydrastis; for diarrhea with passage of undigested food, inactive liver, dull abdominal pain, stools clayey; in diarrhea of dentition; for jaundice with tender liver add rhubarb; biliousness; acute hepatitis add a diaphoretic; occasional dose in chronic hepatitis; after passage of biliary calculi, with hydrastis to alter the conditions giving rise to the concretions; for jaundice add dioscorea, chionanthus or chelidonium; in formative stages of fevers, especially bilious, it often checks the morbid process; in typhoid in malarial districts; in malaria after quinine has broken the chills; dropsy, hydrocephalus, ascites with congested liver and despondency; to remove fluid and prevent accumulation.

Specific Indications.—Drowsiness, dizziness and mental depression with tenderness and heavy pain in liver; tongue white, skin yellow, bitter taste, cold extremities, nausea, dull frontal headache, thirst with inability to drink, restlessness with insomnia; diarrhea with half-digested passages or clayey stools, feeble portal circulation with lassitude and mental depression.

As a purgative leptandrin should be given in doses of gr. 1-6 every hour, or six times this at once. For its action on the chronic affections above enumerated give gr. 1-6 every two hours, or a grain at bedtime. It should not be forgotten that the best effects of this remedy are obtained without obvious catharsis.

LOBELIN.

Standard granule—Gr. 1-12, gm. .005.

Lobelin is a concentration from Lobelia inflata, Indian tobacco. Lobelia contains an alkaloid, lobeline, isolated by Procter, a liquid, described by King as acrid, irritable and unstable. The salts are stable. It is soluble in alcohol, chloroform, and somewhat in water. Lloyd also found a non-crystallizable body to which he gave the name of inflatin. A fixed oil is also extracted from the seeds, which contains the virtues of the plant.

Felter and Lloyd say that lobeline is so quick an emetic that it is impossible to poison with it. A drop of an alcoholic solution on a man's tongue caused instantaneous vomiting. Death in a very prostrated case might result from the repeated vomiting but not from the direct action of lobelia. When the drug is chewed it causes an acrid, pungent sensation, slight nausea, warmth and distention along the oesophagus and stomach, the salivary and buccal glands secreting freely; then epigastric depression, profound nausea and if the dose is large enough, severe and thorough emesis. Profuse perspiration and profound depression attend. The muscles are relaxed, and a period of languor follows. The depression is very short, and immediately followed by a sense of extreme satisfaction and repose. The mental powers are unusually acute. The circulation is weakened by large and strengthened by small doses. The bronchial secretions are increased. If emesis does not occur, purging does. If death results, it is from respiratory paralysis.

Lobelia is nauseant, emetic, expectorant, relaxant, antispasmodic, diaphoretic, sialagog, sedative, occasionally cathartic, diuretic and astringent. It is in no sense a narcotic. Temporarily depressing, its beneficial after-effects make it preferred as an emetic to all others. It is safer and more effective when combined with ipecac. It is used in the forming stage of fevers, with sluggishness and heavily-coated tongue; in chronic diseases to arouse the system from atony; as an emetic give small doses in warm water rapidly repeated. Spasmodic movement is incompatible with nervous and muscular relaxation. Give nauseant doses for chorea, tetanus, children's

worm fits, hysteric and infantile convulsions, epileptiform and other convulsions; it is the remedy for rigid os uteri, relaxing the perineum also; best for a thick, doughy os (gelsemium for thin knife edge); intestinal obstructions, strangulated hernia, intussusception, fecal impaction; asthmatic paroxysms, spasmodic croup, whooping-cough; strychnine poisoning; as a sympathetic stimulant, it improves the innervation of parts supplied by the pneumogastric and sympathetics, useful in indigestion, dyspepsia, gastric sick headache, qualmishness and nausea, intestinal atony and habitual constipation, with podophyllin for costiveness, increases peristalsis, small doses relieve infantile colic; for angina pectoris, cardiac neuralgia and pulmonary apoplexy it is *the* drug; best remedy for markedly slow pulse-wave, with precordial oppression, thoracic pain, difficult breathing, soreness in chest, nausea, tongue heavily coated at base, and fullness of tissue; cardiac congestion; the great value is in respiratory affections, spasmodic asthma, whooping-cough, congestions, pleurisy, pneumonia acute, congestive, breathing oppressed, all chronic sore throats especially ulcerated, chronic pneumonia, bronchitis and laryngitis, asthenic laryngitis of children, dry hard and barking chronic catarrhs, coughs and colds, all respiratory irritations with congestion or oppression, the full oppressed or small feeble pulse with oppression anywhere in the chest, accumulated secretions and loud mucous rales; retrocession of eruptions, scarlatina and measles with tardy eruption, rhus poisoning, locally in many superficial inflammations; and in erysipelas.

Specific Indications.—Full, labored, doughy pulse, blood moves with difficulty; heavy, sore oppressive chest pain; angina pectoris, cardiac neuralgia, pulmonary apoplexy; mucus accumulation in bronchi, convulsive movements, rigid muscles and os uteri with thick doughy edges, rigid perineum or vaginal walls, nausea and sick headache, as emetic for tongue heavily coated at the base.

Ellingwood places lobelia first in his list of agents acting upon the respiratory tract. He terms it a nerve depressant of great power. It is a specific in irritable, spasmodic and oppressed breathing; threatened spasm with exalted nerve action; high nerve tension with great restlessness and excitability, flushed face and contracted pupils; affects children less than adults; for eclampsia and the spasms of hydrophobia; etc. He employs lobelia frequently in combination with capsicum.

The foregoing is the account given by the leading authorities in

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the eclectic school of this remarkable remedy that has held the first place with them for nearly a century, since Thompson introduced it.

Cushny says lobeline increases reflex irritability; accelerating the respiration by stimulating the centers in the cord and medulla. It resembles nicotine in some respects. The blood pressure at first falls, but soon rises above normal. The respirations are faster, deeper and stronger. He limits its therapeutic use to nervous asthma.

Cornet found lobeline sulphate effective in the spasmodic cough of phthisis, and giving almost magical results in the various forms of croup. It also proved useful in chronic bronchitis, asthma, and the convulsive cough of pertussis.

One general indication for its use seems to have been too slightly advocated—that of loosening secretions in catarrhal maladies of the dry type.

The dose of lobelin is from gr. 1-12 to 1-2, repeated every five minutes to thirty, always given dissolved in hot water, as the granules are apt to pass through the bowels unchanged. Thus given in smaller doses, lobelin has proved quite effective in costiveness of very young infants.

LYCOPIN.

Standard granule—Gr. 1-6, gm. .01.

Lycopin is a concentration from Lycopus Virginicus, or bugle weed.

Felter and Lloyd term lycopus a certain sedative, mild narcotic, sub-astringent and tonic. Its sedation is best shown when the heart is tumultuous, and pulse rapid with evident lack of cardiac power. It is useful in the late stages of acute affections with great debility and in chronic cases with fast pulse. It acts somewhat like digitalis, controlling excessive vascular excitement, and lessening exalted organic action. It improves the appetite, reëstablishes normal secretion, and improves blood making and nutrition. It is a remedy for morbid vigilance and insomnia, painful and distressing indigestion, to purify the blood for old ulcers, for diabetes mellitus, albuminuria with rapid irritated pulse; frequent small hemorrhages, such as hemoptysis, epistaxis, hematuria, uterine and intestinal hemorrhages; dysentery and diarrhea, especially of phthisis, soothing in gastritis and enteritis and the gastric and intestinal affections of drunkards and of malaria; inflammations of the heart, palpitation, with irritability and irregularity with dyspnea and oppression; dilated and hypertrophied hearts, relieving the suffering and

anxiety; exophthalmic goiter; acute and still more in chronic lung ails, a gentle sedative and tonic, for irritation and cough with tendency to hemorrhage, relieves cough of chronic bronchitis, pneumonia and consumption, giving rest and quieting pain, acute catarrhs; for pulmonary hemorrhage with cinnamon and ipecac the best of remedies.

Specific Indications.—Vascular excitement, small hemorrhages from determination of blood to lungs, kidneys or gastrointestinal organs; albuminuria with fast pulse; debilitating chronic cough with free sputa; wakefulness and morbid vigilance with too active circulation; fast pulse with high fever, and in tuberculosis.

Ellingwood looks for the specific effects of lycopus in heart affections with irritability and irregularity, dyspnea and oppression. It has succeeded in incipient phthisis, and hemoptysis; high fever of typhoid fever; promotes digestion and invigorates the appetite.

The dose of lycopin is from gr. ½ to 2 before each meal and at bedtime.

MACROTIN.

Standard granule—Gr. 1-6, gm. .01.

Macrotin is a resinoid from Cimicifuga racemosa, or black cohosh.

Shoemaker says that cimicifuga in small doses stimulates the digestion, increasing the gastrointestinal secretions. It also increases the bronchial mucus, and the urine, and strengthens the heart. The effect on the circulation resembles that of digitalin but is less powerful. Brunton styles it a succedaneum for ergot. Full doses slow the pulse and increase its force, raise vascular tension, and stimulate contractions of the uterus. It lowers the reflex excitability of the cord, dilates the pupils, and dimness of vision, vertigo, intense headache, nausea and vomiting result from too large doses. Hypnotic effects have been reported, with relief from pain and spasm. Death may be caused by paralysis of respiration.

Lloyd says cimicifuga acts also upon the skin, imparting its earthy odor to the urine; small doses given hourly produce symptoms closely simulating those of delirium tremens; green tea is said to counteract the narcotic effects; cimicifuga increases the menstrual flow and possibly the venereal appetite.

Felter and Lloyd credit this remedy with decided values in rheumatism and neuralgia; muscular rheumatism, lumbago, torticollis, acute non-spinal pains such as gastralgia, enteralgia, tenesmus of

bladder, pleurodynia, mediastinal pain, orbital and aural pains, eye strain with affection of ocular muscles; acute conjunctivitis; rheumatoid dyspepsias, with dull pain and tendency to metastasis worse on taking food or drink, stomach walls feeling as if contracting on a hard substance, with rheumatic history; atony of reproductive tract, pains from imperfect menstruation, suppressed and especially non-established menses, unsurpassed in dysmenorrhea; best in irritation and congestion of uterus and appendages, tensive dragging pains, like rheumatism; if despondent and chilly add pulsatilla, especially in anemics; if opposite, add gelsemium; for reflex side-aches of virgins, mastitis and mastodynia; uterine rheumatism and leucorrhea; sterility from uterine atony, reflex mammary pains during gestation, ovaralgia, neuralgia, orchialgia and aching prostate, and as a tonic in spermatorrhea; excels ergot in parturition by producing natural pains, an excellent *partus praeparator* if given for some weeks previous to confinement, dissipating false pains and strengthening true ones, the best remedy for after-pains and allays the nervous excitement following labor; for nervous cases, useful in chorea, best when menses are deficient, as an antispasmodic in hysteria, epilepsy due to amenorrhea, asthma, periodic convulsions, nervous excitability, whooping-cough, delirium tremens and other spasms; headache from cold or congestive, neuralgia, dysmenorrhea or influenza; in phthisis lessens cough, soothes pain, especially subscapular aching, lessens secretion and allays nervousness; malarial fevers are benefited by its tonic power; for rheumatic fever add aconite or veratrum; prompt and decisive in cerebral complications of eruptive fevers; especially in children, and in simple fevers; lessens the force and frequency of the pulse, soothes pain, allays irritability, and lessens cerebral irritability and the tendency to congestion; in fevers, especially exanthemata, it often causes diaphoresis and diuresis, controls pain like the bone-ache of smallpox, renders the attack milder, relieves the headache and backache preceding the eruption, and has been thought prophylactic against smallpox; has a tonic influence over serous and mucous tissues, and is a superior remedy in their chronic maladies; add alkalies for acidity of stomach; often relieves promptly pains that have existed long; locally it is applied for neuritis, neuralgia, tic, spinal inflammation, periodic cephalic pain, ovaritis, spasms of the broad ligaments, rheumatism, crick in the back or side, ocular inflammations, and old ulcers. Preparations from recently dried roots are preferred; in phthisis, cough, acute rheumatism, neuralgia, scrofula, phlegmasia

dolens, amenorrhea, dysmenorrhea, leucorrhea and other uterine affections, the alcoholic preparations are urged alone.

Specific Indications.—Muscular pains; uterine pains with tenderness, false pains, irregular pains, uterine rheumatism, dysmenorrhea; as an antirheumatic when pulse is open, pain paroxysmal, skin not dry and constricted (Scudder). To these add soreness, dragging pains in hips and loins, rheumatoid muscular pains and dyspepsia, chorea with absence of menses. Ellingwood says an overdose is promptly signalled by the appearance of the characteristic headache, of bursting, tearing character, with injected conjunctivae and flushed face; which abates when the remedy is suspended. He considers muscular aching the specific indication for cimicifuga. It is the remedy for hysteria with flushed face and hot head, restless nervous excitement and general muscular aching. He also gives it for angina pectoris, functional irregularity of the heart, cough of excessive nervous irritation, reflex, irritable or acute bronchitis; lithemia, sciatica, dysmenorrhea and amenorrhea with aconite if from sudden cold, pulsatilla if from nervous shock or functional irregularity of long standing, helonias if with weight and dragging in lower abdomen, and in all these it is better if leucorrhea is present. It is useful in male gonorrhea with aching in bladder and kidneys; with aconite, gelsemium, or hydrangea.

Shoemaker recommends cimicifuga in the menstrual disorders of young girls at puberty. Simpson used it for hypochondria and melancholy, and Ringer in rheumatoid arthritis. In weak and fatty heart Shoemaker pronounces it safer than digitalis.

Lloyd, who never has a good word for the older eclectic resinoids, prefers the fluid preparations; but Ellingwood says cimicifugin, or macrotin, fully represents the remedial virtues of the plant.

The dose of macrotin is from gr. 1-6 to 1 every hour in acute or painful affections till relief or the headache described by Ellingwood, or nausea, results. In chronic maladies the dose should be thus ascertained and it may then be so distributed that four daily doses are taken, one before each meal and one at bedtime.

MENISPERMIN.

Standard granule—Gr. 1-6, gm. .01.

Menispermin is a concentration from Menispermum Canadense, or yellow parilla. The plant contains two alkaloids, berberine, and

menispermine, or menispine according to Maisch. The latter seems to closely resemble berberine in its action.

Felter and Lloyd say that menispermum is tonic, laxative, alterative and diuretic. From medium doses a slight increase in the volume of the pulse is evident, and the appetite is increased as well as the bowel action. Excessive doses cause purging and vomiting but no other effects. Menispermum is a superior laxative bitter. It is probably of value in leucocythemia, especially when the spleen is affected.

Specific Indications.—Skin brown, tongue coated at base, tip red, irregular appetite, constipation (Scudder).

This plant has had some repute as a remedy for scrofulous affections, but it seems probable that all its virtues may be explained by the presence of berberine, and that that alkaloid will usefully replace the plant.

The dose of menispermin is a grain three to ten times a day.

MENTHOL.

Standard granule—Gr. 1-12, gm. .005.

Menthol is a camphoraceous body derived from oil of mint, that in the market being mainly from a Japanese oil. It is used externally for many purposes, but little internally. But as it may with propriety replace the old carminatives, it is well that we should be prepared to recognize any effects coming from this body, physiologic or toxic. Menthol so closely resembles camphor in its internal effects that the description of either will apply to the other.

Menthol is a local irritant and when swallowed causes a feeling of warmth in the stomach and coldness in the throat and mouth. Large doses cause nausea and vomiting; headache, confusion and excitement with slow pulse and flushed skin. There may be hilarity, delirium, hallucinations, restlessness, or motor excitement passing into convulsions. Periods of quiet alternate which increase until coma is present. Sometimes this occurs without the period of excitement. The spinal cord is depressed, the reflexes depressed, by very large doses. The convulsions are due to stimulation of the cerebrum. The heart is slowed somewhat, the vascular tension raised, the capillaries of the skin dilated, the respiration slowed and deepened slightly, normal temperature unaffected but fever lowered.

Menthol possesses considerable antiseptic power, and stops the movement of leucocytes. It is excreted by the kidneys combined with glycuronic acid.

Menthol has proved useful for the vomiting of pregnancy. It may be given for gastric pains and colics, flatulence, in fact for the whole line of affections in which a carminative is indicated.

The dose is gr. 1-12 to 1-4, repeated every five minutes till relief ensues; and best given dissolved in alcohol, ether or chloroform, and then diffused through a little hot water. The tablets should not be swallowed undissolved, as they may irritate the stomach. Fermentation in the stomach is usually stopped promptly by a small dose—gr. 1-12—of menthol repeated quite often.

MERCURY.

Standard granules—Mercury bichloride gr. 1-134, gm. .0005; mercury biniodide gr. 1-67, gm. .001; mercury cyanide gr. 1-134, gm. .0005; mercury protoiodide gr. 1-6, gm. .01; gr. 1-2, gm. .03; mercury salicylate gr. 1-12, gm. .005; mercury with chalk gr. 1-6, gm. .01; calomel gr. 1-67, gm. .001; gr. 1-10, gm. .006; gr. 1-6, gm. .01; gr. 1-2, gm. 03; gr. 1, gm. .06; calomel and capsicum gr. 2, gm. .12; calomel and ipecac. gr. 1-8, gm. .00013; calomel ipecac. and soda gr. 1-10, gm. .006; calomel and iridin gr. 1-6, gm. .01; calomel and soda gr. 1, gm. .06.

Acute mercurial poisoning is generally due to corrosive sublimate. When swallowed it at once causes burning pain in the mouth, throat and stomach; nausea, and vomiting of bloody shreds of membrane; diarrhea, violent tenesmus, dysenteric stools, with evidences of collapse—small weak thready pulse, shallow rapid respiration, cold clammy sweat, sunken eyes, the voice may sink to a husky whisper, the face pinched. There are no constant cerebral symptoms. The face is anxious and denotes the pain from which the patient suffers, which is that of acute gastritis. The urine becomes scanty or stops; the last passed containing casts and albumin, sometimes sugar. Death may occur within an hour from shock but usually comes later, when the patient is exhausted by the continued action of the poison. If the poisoning is from the absorption of dressings the corrosion of the mouth is absent but the other symptoms are similar. Salivation and its sequences occur within a few days.

In chronic poisoning the local effects are wanting. This begins with a metallic taste, and soreness of the gums and tongue. One or more teeth feel as if too long, and are tender when bitten upon. The breath becomes fetid, the buccal mucosa swollen and all the glands secrete freely, the tongue swollen and coated, and ulcers appear along its side and along the edges of the gums. If continued,

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these ulcers spread and may become diphtheritic or gangrenous, the teeth loosen and fall out, and necrosis may extend to the maxillary bones. Some rise of temperature is usual. The appetite fails, diarrhea may occur, erythema, urticaria, eczema, albuminuria, glycosuria, disturbances of menstruation, cachexia, are symptoms observed in more or less frequency. Workers in mercury are liable to erethism, tremor, neuritic pains, anesthesias, affections of the eyes or ears, local palsies, etc.

Physiologic Action.—Taken continuously in doses short of toxic, mercury stimulates all the faculties, physical and mental. All the glandular secretions and excretions are stimulated, the processes of metabolism hurried, the appetite enormous, the sexual desire and power increased, and all the bodily and mental functions stimulated. In fact, the patient feels that he is living at a rapid rate, and using up his vitality fast. The great stimulation of the lymphatics occasions a rapid absorption and excretion of morbid products, and there is a curious feeling of internal "cleanness," a sense of new birth, experienced. With this comes a sense of capacity for great things. This description is based on the experiences of a colleague, who became accidentally inoculated with syphilis, unsuspected until constitutional symptoms appeared. He was then placed on mercury and kept as close to the toxic dose as possible without actually touching it, for a year. When soreness of a tooth appeared the dose was slightly lowered till the soreness ceased, and after a few days slowly raised again. The theory on which this use of mercury is based is as follows: This drug causes disintegration of the normal tissues when given in toxic doses. The syphilitic tissues which contain the specific cause of the disease, are liable to spontaneous death, and hence are more liable to be destroyed by mercury than the sound tissues. The art of administering mercury then consists in giving such a dose as will destroy syphilitic growths without being strong enough to break down normal cells. For this purpose ascertain what dose will produce the slightest tangible—that is toxic effects, and keep just below it. The medication should be kept up as long as there is any visible evidence of the malady remaining and for at least three months more; and after this resumed whenever any symptom of the disease appears. By this means, and this alone, the writer believes that syphilis may be radically cured. The treatment should be instituted the moment the diagnosis is satisfactorily made.

Mercury is eliminated through the kidneys, the intestines, and to

some extent by all the emunctories. It passes to the mother's milk, and through her blood to the fetus *in utero*. It has been detected in the urine a day after its administration began, and six months after it had been stopped. The form of mercury for use in syphilis is a matter of individual preference, all forms being efficient. The writer prefers the iodides because they are more easily eliminated than other mercurials, and may be combined with other iodides, of iron, calcium and arsenic, when desired.

Salivation may be prevented by keeping the teeth in order, with brush and the aid of the dentist, and by using atropine when the danger point has been passed accidentally. Much of the local disease in the mouth is due to the elimination of mercury there, and is easily preventable.

Therapeutics.—Mercury was long used as an antiphlogistic in all fevers and inflammations, but under the attacks of Thomson and Reade it became unpopular and fell into disuse. It was restricted to serous inflammations, and then to iritis, where it is still employed. We may see a revival of this use any day. The old physicians were a unit in asserting that when the constitutional effects of mercury were manifest the inflammation was obviously undergoing resolution. The dependence of disease upon microörganisms and the superlative powers of mercury as a germicide have given the necessary excuse for a revival of the practice. Calomel is still employed as a cholagog purgative, and now given in doses of gr. 1-12 to 1-6 every hour till a grain is taken, followed by a saline laxative. It is specially indicated when the stools are white and acholic, fetid. A certain sense of well-being follows mercurial purgation that does not ensue when other purges are employed alone. But the habitual use of calomel in this way is not advisable.

As an intestinal antiseptic calomel is still used in typhoid fever, since Wunderlich showed that the results of other treatment were better when a preliminary dose or two of calomel had been given. Five to ten grains are here advisable. The benefit arises from clearing the bowels of their decomposable contents. In most febrile maladies this is good practice.

As a diuretic calomel was given with squill and digitalis, and possesses unquestionable value. Especially in cardiac dropsies it is of use, to clear the tissues of encumbering fluid while more rational measures are employed to prevent reaccumulation, such as the dry diet. A grain of calomel with digitalin gr. 1-67 to 1-22, and

scillitin in the same dose, may be given every four hours for four doses.

Especially in opening the treatment of malarial fevers is the calomel purge indicated, followed by salines or purges of the jalapin series.

For children, the ill-temper, muddy complexion and coated tongue, with indigestion, have been considered indications for calomel, which is always beneficial; but any laxative like rhubarb or juglandin, followed by antiseptics, does the work as well and without the danger.

Mercury bichloride is of value in dysenteries, in doses of gr. 1-134 every one to three hours.

Mercury with chalk is an old favorite for children.

Mercury is contraindicated by the cachectic state, general debility, anemia not syphilitic, feeble digestion, tuberculosis possibly though this is denied, nephritis especially if elimination is defective, and when iodine is being taken or used. Pregnancy is usually a contraindication.

In acute poisoning evacuate the stomach thoroughly. If there is no stomach tube at hand, give the two powders of a seidlitz or soda powder in succession, so as to mix and effervesce in the stomach, which will answer the purpose well and without nausea. Tannic acid or any drug containing it may be given to render the mercury less soluble, and eggs, milk or any albuminous substance to neutralize it.

For chronic poisoning evacuate the stomach and bowels, stop the mercury, use astringent antiseptic mouth washes, with atropine enough to keep the mouth dry, and eliminate by iodides given to saturation. At first this will render the mercury in the body soluble and active, and it is not to be given as long as active symptoms of the poison are present. The generally advocated potassium chlorate is inferior to solutions of hydrastine, a grain to the ounce, or of tannic acid, or any of the volatile oils. Careful cleanliness is essential.

MORPHINE.

Standard granules—Hydrobromate, gr. 1-67, gm. .001; hydrochlorate, gr. 1-67, gm. .001; hydrochlorate, gr. 1-12, gm. .005; sulphate, gr. 1-67, gm. .001; sulphate, gr. 1-12, gm. .005.

Morphine is derived from opium, the "concrete juice of the Papaver somniferum." It exists in opium in proportions varying

from 2.7 per cent to 22.8 per cent in combination with many other alkaloids, which also exist in widely differing proportions, and whose effects vary through the whole gamut of action from pure depression to pure stimulation. While the general effects of opium are apt to approximate those of morphine they may prove to be exactly the opposite; and this exceptional condition may appear at a time when life hangs in the balance. For these reasons and others, the medical profession has to a great extent dropped the use of the galenic opiates and employs morphine instead.

Physiologic and Toxic Actions.—Morphine causes first a depression of the voluntary movements, later marked increase in reflex excitability; drowsiness ensues, passing into sleep, that after small doses being rather a state of quiet; the patient may be easily aroused. This state is accompanied in some cases by a sense of well-being, termed euphoria, and this is exceptionally of such delightful quality that the patient once experiencing it craves a repetition. A woman to whom I once gave a hypodermic of morphine told me she felt as if floating on clouds of bliss. To the majority no such sensations come. The drug is to the intellect a paralyzant from first to last. At first it is the reason and judgment that are paralyzed, the self-consciousness is subdued while the fancy is unaffected, so that the patient may shine in conversation and astonish those who only knew him when fettered by timidity or a sense of propriety. With larger doses the coherence of thought becomes confused, the sense of time is weakened but not so markedly as with cannabis, and somnolence comes on as the drug affects the sensorium more. Dreams follow, of pleasant form at first, but later of frightful nature.

Still larger doses cause deep sleep, from which the patient is with the more difficulty aroused as the doses rise. Finally the state becomes that of coma, the respiration sinks in frequency, the pulse is good, pupils contracted to a pin point, face purple and congested, skin warm but axillary temperature below normal, and the nose becomes raw with the rubbing to relieve itching. The respirations weaken and may assume the Cheyne-Stokes form. Cyanosis creeps in, the pulse becomes faster and weakens, and the pupils dilate just before death, which is from arrest of respiration, the heart beating feebly after death.

After remedial doses of morphine the patient awakes with headache, dullness, the digestion stopped and appetite lost, the mental

faculties sluggish. Delirium and convulsions may occur as idiosyncrasies, or as evidence of defective renal elimination.

The depression of morphine is exerted first on the brain, the stimulation on the cord. Large doses are requisite to produce the latter. Small doses often assuage or remove the pains of disease without destroying consciousness. Sudden shocks are felt when the same injury gently made will be unnoticed. Small doses have little effect on the motor cerebral centers while large doses lower or abolish their irritability. Cutaneous sensation is lessened. The vascular pressure is high, the arteries of the skin of the head and neck dilated, and perspiration is increased. As asphyxia advances the pressure varies, though if artificial respiration is kept up this effect is absent. The respiratory center is paralyzed before the centers for cardiac inhibition and vasoconstriction are much affected. The peripheral muscles and nerves are only affected by lethal doses. The secretions are lessened, except when nausea occurs when the saliva and perspiration are increased. The urine is often retained in the bladder.

Morphine checks the movements of the stomach and bowels, as well as the intestinal secretions, and constipates. The excretion of carbonic acid is lessened, lactic acid increases, and glycogen disappears from the liver. Sugar may appear in the urine.

Morphine is excreted mainly in the saliva, gastric juice, intestinal fluids, and by the kidneys. It appears in the stomach 2½ minutes after injection hypodermically, and ceases to appear there after an hour. Some of it may be oxidized in the body.

Therapeutics.—The place occupied by morphine is peculiar. Like alcohol it does a great many things and does them well; but there are few if any uses to which this drug is put that may not be better accomplished by some one or other of the agents in the hands of the Alkalometrist. It is safe to say that morphine will be employed much less frequently, as the physician becomes familiar with the use of definite, uniform agents, and acquires a liking for a certain nicety of applying his therapeutics. Morphine and alcohol are the standbys of the lazy doctor.

As a reliever of pain, morphine acts quickly and powerfully. The pain of imprisoned pus or strangulated tissue requires quick surgical relief instead of drugs. The writer was once called from his bed to see a man whose testicle he had strapped with adhesive the preceding day; and fortunately arrived in time to remove the straps before the death of the strangulated tissues. It was an object lesson as to

the misuse of morphine he has never forgotten. Spasmodic pain of all sorts is better relieved by hyoscyamine, especially by the triad of this with glonoin and strychnine arsenate, than by morphine. And this applies to so many forms of pain that hyoscyamine threatens to dethrone morphine as "Pain King." This is well illustrated by the use of these drugs in the atrocious pangs of gallstones. Here it is the custom to give morphine hypodermically. No relief ensues, and the dose is repeated, increased, at last desperately as the pain neutralizes the drug; till at last the stone rolls out of the common gall-duct into the intestine, the antagonism of the pain is removed, and just then the last huge dose of morphine comes into play, and the patient is narcotized. The same holds good as to renal calculi. All forms of colic are better treated by hyoscyamine than by opiates. Dysmenorrhea requires a careful differentiation as to the variety and the causes, and there is no excuse for the prescription here, which has made so many drug fiends.

No form of headache is suitable for morphine. Neuralgias are better relieved by atropine, which sends the blood back to the pale, shrunken skin. Many of them are toxemic, and require stimulation of elimination, which morphine checks—though by locking up uric acid and checking the absorption it gives temporary relief.

The pains of inflammation are better treated by aconitine, heat or cold locally, and such treatment as is indicated in each special case. The hot water bag has done away with the use of paregoric in innumerable cases.

Rheumatism calls for salicylic acid, syphilis for mercury or iodides, gout for colchicine, etc., until one is led to ask, what form of pain is left for morphine? The writer cannot answer this query.

Morphine causes sleep. Sleep is so pre-eminently a necessity of the human body that it is impossible to prevent it for more than a night or two, even by the infliction of severe pain. If sleep fails to come at the proper time, there is always a reason for it; and the duty of the physician lies in ascertaining and removing the obstacle, instead of smothering the protest of outraged nature with drugs. But if these be required, morphine is of all hypnotics the most objectionable. It does not cure the tendency to insomnia but confirms it, so that the patient finds himself less able to sleep without it after every dose. It invariably begets the drug habit if permitted. It constipates and interferes with the digestion so that the harm is greater than the benefit. The sleep is less natural and refreshing

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than that following the use of trional and sulphonal, and less prompt and refreshing than that of hyoscine.

As an antispasmodic morphine cannot compare in efficacy with atropine, and in many cases the harmless agents of the valerian group answer the purpose as well or better and without the objections cited above.

Morphine checks peristalsis, and hence is given often for diarrheas and dysenteries. The writer saw a patient once die of dysentery although the stools had been locked up with opium. He learned then that the discharges do not constitute the chief danger in bowel complaints. The first indication in such maladies is to remove from the bowels all fermenting and irritating substances that cause and keep up discharges; then give rest by restricting closely the ingesta. Excited peristalsis may be soothed by heat externally and small hot enemas, by bismuth salts, and the normal secretions re-established by minute doses of emetine and rhein or juglandin. There is little good but much harm to be done by the giving of opiates in intestinal maladies. Sometimes in dysentery very small doses of morphine may be admissible; but it must not be forgotten that narcotism is most readily induced here, and most dangerous. Generally by locking up in the bowel the cause of the irritation morphine increases and prolongs the attack. The writer has known a morphine devotee to give this drug for a diarrhea set up by nature to get rid of an accumulation of scybala, which condition was continued for months by giving morphine at every indication of bowel action. A few doses of oil and enemas cured the affection within two days.

Morphine relieves cough and favors expectoration. The latter is apparent, and is due to the fact that the cough being quelled the sputa collects, so that when raised there is more of it. Codeine relieves cough better than morphine, and does not interfere with digestion as much. Nor is it so apt to induce a habit, though not altogether faultless in this respect. But small doses of emetine, lobelin or apomorphine loosen a cough by increasing the fluidity of the mucus, and soothe the irritated mucous membrane. The inhalation of steam does more than opiates to soothe this irritation. Strictly irritative cough is better relieved by small doses of chloroform internally, or by zinc cyanide, neither of which is objectionable in the way morphine is.

Morphine is the remedy for emergencies, to relieve by hypodermic when there is great pain and other remedies are not at hand. Apart from this the field for the legitimate use of morphine is ex-

ceedingly restricted. In diabetes it certainly checks the output of sugar, but we have been unable to find any case cured by it.

The treatment of acute opiate poisoning consists in emptying the stomach promptly, and sustaining the respiration. Hypodermics of strychnine are useful, with artificial respiration. As long as this is sufficient it is worse than useless to try to prevent sleep. Large doses of coffee combat the effects of the drug to some extent, but atropine enhances some morphine effects while combating others. The inhalation of oxygen is a useful measure.

The treatment of the morphine habit is a very simple measure. The patient must be under such conditions that the physician can positively control the quantity of the drug taken? Unless the patient is willing to allow this he is not really desirous of quitting his habit. The bowels will invariably be found to be loaded with a quantity of feces almost past belief. This accumulation is to be removed by non-irritant cathartics and enemas, and the emunctories flushed thoroughly. The strength is to be sedulously maintained by easily digested and nutritious food, and by such heart tonics as may be required—they always are. When released from the paralyzing effects of the drug the cells pour out their burdens of retained toxins and these must be carried out of the body promptly and constantly. Autotoxemia is the cause of the distress known as "withdrawal symptoms." The morphine is best taken away at once, though this depends on the case, and with aged subjects who have used the drug long, mercy should rule. Severe distress calls for a moderate dose of morphine, and revision of the means for elimination. After 48 hours' abstinence sleep usually comes without drugs. Hot baths are of great service and very grateful to the patient.

The administration of other stupefying drugs to replace morphine is useless and apt to result in a new habit, besides smoothing the way to a return to the opiate.

MUSCARINE.

Standard granule—Sulphate, gr. 1-250—gm. .00025.

Muscarine is an alkaloid derived from the Amanita muscarius, or fly fungus. It is of syrupy consistence, soluble in water. In its action it closely simulates pilocarpine and picrotoxin, but is more toxic. Overdoses occasion marked debility; the pulse becomes weak and small, the skin pale and cold, cold sweat appears, followed by vomiting without nausea and serous purging without pain or dis-

tress. The muscular weakness is extreme. These symptoms come in one or two hours after eating the mushrooms, and in non-fatal cases subside within two hours, leaving a sense of debility. There is no cerebral symptom apart from some vertigo due to the anemia of the brain. Shoemaker says the heart and lungs are slowed, the heart finally stopping in diastole. Blood pressure is lessened markedly. The secretions of the skin, liver and intestines are increased, the urine reduced or suppressed. Convulsions may occur from carbonic acid accumulation. The pupil is contracted by the internal use of muscarine, dilated by its local application. Cushny says muscarine causes gastric distress much more marked than that of pilocarpine and is not as well suited for remedial uses. But the writer noted the contrary when poisoned by this agent.

Shoemaker gives the dose of muscarine as gr. 1/8 to ij, but this cannot refer to the muscarine supplied by Merck. It is a difficult remedy to use, because it is so rapidly eliminated.

The best way to use this powerful agent is probably to administer a granule in solution every five minutes till the desired effects are manifest.

The active agents in the fungi have not been sufficiently studied. One is employed in Russia as an intoxicant, of such attractiveness that it is said that when a wealthy man goes on a debauch with it, his poorer neighbors drink his urine to obtain a second-hand one thereby. No intoxication or pleasurable effect followed when the writer partook of a toxic dose of the fly amanita; but on the other hand no such disturbance of the stomach occurred as Cushny describes. In fact, it was our opinion that as an emetic without nausea and a cathartic without distress, it had no rival in the known materia medica.

NARCEINE.

Standard granule—Gr. 1-67, gm. .001.

Narceine is an alkaloid from opium. It is found in an average proportion of 0.2 per cent. Many years ago Da Costa published an account of some trials of narceine in the Reports of the Pennsylvania Hospital; in which he concluded that this agent had little if any value. But the narceine then furnished was probably too impure to warrant any deductions whatever from its trial. The same may be said of the specimens from which Claude Bernard derived his very favorable opinion of this alkaloid. We must have recourse to

modern observations made with agents of undoubted purity before advocating or condemning a drug.

Narceine is soluble in 945 parts of alcohol at 80 per cent, easily in boiling alcohol, not at all in ether, benzole or petroleum ether, slightly in chloroform and in amylic alcohol. It has little affinity for acids, but forms crystallizable salts with hydrochloric, sulphuric and nitric acids.

Physiologic Action.—Van Renterghem experimented with pure narceine. He took evening doses of gr. 1½, followed by slumber calm and more profound than usual; waking with a sense of heaviness in the root of the nose and the forehead, remaining till afternoon; the narceine did not interfere with the customary morning dose of saline laxative, but the stools were less liquid. The appetite was unaffected, no dryness of the mouth or coating of the tongue. One day, suffering with slight diarrhea with abdominal pains, an evening dose of narceine, gr. 1½, was followed by sleep and calmed the intestinal disorder. Next day no abnormal sensations, the bowels acting as usual. A young woman of 20, suffered with a cough "ferine," and he gave narceine and iodoform, a granule each every quarter-hour. Next day the cough had ceased; she had begun on the third tube of each—20 granules in each—and now took them every hour.

To a woman of 26 affected with uterine epithelioma and suffering the atrocious pains that prevented sleep, resisting galenic opiates Rabuteau gave a vaginal injection containing narceine. One hour later the pain had disappeared, the patient was soundly asleep, and on his next visit thanked the doctor warmly. This happy result was repeated.

He also obtained satisfactory results from narceine in sciatica neuralgic pains of various sorts, relieving and even curing them with narceine, which often proved superior to morphine. As a remedy for cough this remedy succeeded for Laborde in whooping-cough, Line in acute bronchitis, Oettinger and Levis in asthma.

As a muscular relaxant it has succeeded in hysteric convulsions and spasmodic contracture of the limb that had resisted morphine (Eulenburg).

Rabuteau says: "This precious substance also arrests diarrhea. Not only does the intestinal mucosa secrete less under its influence, but the buccal, pituitary and even the conjunctival mucosa show a sort of desiccation; thirst augments as with morphine. Often doses of gr. 1½ to 3 are required to obtain these results, and diarrhea is

as well arrested as by morphine. Narceine is nevertheless to be ferred as not causing nausea or anorexia, especially with hisical cases narceine even relieves these disagreements."

Exceptionally writers have mentioned as due to narceine, vertigo, ging of the ears, headache, nausea and vomiting on waking, or itement and insomnia.

Hypnotic doses after a period of acceleration of the pulse, slow heart and the respirations; if the narcotic stage is prolonged re may even be a lowering of the temperature (Eulenberg, Sich-g).

The pupils do not contract during the sleep of narceine, and the ex excitability is less dulled than after morphine (Sichtung). Fabini and Ottolengui state that narceine increases the excre-i of urea. Prolonged use induces tolerance.

Laborde finds narceine perfectly tolerated by infants.

Injected under the skin it diminishes tactile sensibility as mor-ne does; introduced into the eye it does not affect the pupil ılenberg).

Narceine is eliminated chiefly through the urine and the bile ragendorff and Schmemann).

Therapeutics.—Van Renterghem recommends narceine as a suc-ıneum for morphine in treating women and children, weakly ions and those unduly susceptible to opiates. Narceine is useful n it is important to avoid the constipation of morphine. As a notic narceine does better for persons bedfast, gravely ill, than the well; it is specially valuable in insomnia caused by obstinate gh, as in phthisis. Valledor values it above codeine as a remedy coughs.

Burggraeve also advised narceine for harsh coughs, painful, and ı calmant of the nervous system. It is an anodyne analgesic in pains of the inflammations, given in suitable doses even during height of the fever, associated with the other modifiers demanded he case. It is then rare that this remedy does not lessen the , spasm, agitation and fever. In neuralgias, headache, inter-al neuralgia, gastralgia, sciatica, narceine often succeeds when phine fails. Here aconitine, gelseminine, butyl-chloral, atropine icutine should be associated as indicated.

The granules of gr. 1-134 each, Van Renterghem gives to a new-ı infant without division, if needed, every hour. Older children take two to five granules at each dose. It may be given hypo-nically. Harley's formula is preferred: Pure narceine 3 parts,

glycerin 45; warm slightly to perfect solution, then add 1 part hydrochloric acid and 2 parts distilled water. This makes a solution of one part to twenty—or 5 per cent.

Narceine has received little attention at the hands of American alkalometrists, because the tendency here is to make little use of opiates, and when unavoidable to substitute codeine for morphine. But the foregoing account of the French investigations show that there are values in narceine that should not be overlooked.

NARCOTINE.

Narcotine forms about 6 per cent of opium, the percentage varying widely.

The formula is $C_{22}H_{23}NO_7$. It resembles codeine somewhat more closely than it does morphine, but has less depressant action than either. In frogs it causes some depression, quickly followed by an increase of reflex excitability like that produced by strychnine. In mammals the depression is still slighter, followed by excitement, restlessness, tremors, increase of reflex excitability even to convulsions, ending in death; the symptoms exactly coinciding with those of strychnine. The pulse is slowed by direct action on the heart. Very large doses have been taken with little or no narcotic effect, narcotine being much less toxic than codeine (Cushny).

Narcotine is considered a cotarnine opianate. Narcotine is obtained by exhausting opium with water, treating with hydrochloric acid, precipitating with sodium carbonate, and crystallizing in alcohol in the presence of a little animal black. It forms handsome needle crystals, insoluble in water, soluble in hot alcohol, in choroform, and in 33 parts of ether (Bocquillon).

Narcotine possesses antiperiodic properties similar to those of quinine, which it is said to excel. It causes diaphoresis. It is the least toxic of the opium alkaloids (Claude Bernard), less convulsant than thebaine and papaverine, while doses of 0.40 (gr. 6) did not induce somnolence.

This agent has been used in malarial affections in India, in doses of 0.05—0.15 (Shaughnessy), and narcotine sulphate in doses of one gram (Root).

When narcotine is oxidized, oxygen and water are abstracted and the base is decomposed into opianic acid and cotarnine. The hydrochlorate of cotarnine has been termed stypticin, from its styptic properties. The formula is $C_2H_4NO_4Cl$ (Merck gives it as

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$C_{12}H_{12}NO_2HO$ HCl). It is a yellow crystalline powder, very bitter, easily soluble in water and in warm alcohol. The solutions are yellow but become darker on exposure to light. Its chemical constitution closely approximates that of hydrastinine, differing by the substitution of the methoxyl group, OCH_3 for an atom of hydrogen. The physiologic effects confirm this close relationship. In frogs stypticin causes central paralysis. In mammals large doses cause narcotism, followed by paralysis, death occurring from paralysis of the respiratory center. The fatal result can be prevented by artificial respiration. No influence on the circulation could be detected, wherein it differs from hydrastinine. Nevertheless, clinical observation has demonstrated that stypticin possesses valuable hemostatic properties. This is especially the case with uterine hemorrhages. It is useless in hemorrhage from uterine cancer. So also, it has proved ineffective in hemorrhages depending upon pelvic exudations and ovarian congestions. In menorrhagia and metrorrhagia it has proved exceedingly effective. The drug is well tolerated by the stomach. Pregnancy does not contraindicate its use (Liebreich), as it does not cause uterine contractions.

Rousse and Walton pronounced stypticin a tonic to the circulation, especially the heart, and useful in hemoptysis. The dose is 0.20 (gr. 3), best hypodermically in the gluteal region (Gottschalk). In very severe menorrhagias he gave it four hours before the expected flow. By the mouth, 0.025 (gr. ½) five times a day, in capsule or tablet; the latter being preferable on account of the bitterness. Hypodermically it may be injected in 10 per cent watery solution (Merck).

Especially in the profuse menstruation of young girls it has proved effective and in those occurring about the climacteric. Merck recommends it in doses from gr. ¾ to 4, five times a day.

Gottschalk gives stypticin the preference over other hemostatics in dysmenorrheic hemorrhages, on account of its sedative, anodyne and soporific properties. In subinvolution the hemostatic effects were in every case permanent, which would indicate the valuable power of contracting the connective fibers, but not the muscular tissue of the enlarged uterus. The action is primarily on the nervous centers, lowering the rapidity of the respiration and secondarily the blood-pressure. It is therefore a relaxant hemostatic, for active hemorrhages.

Boldt has found stypticin useful in acne, rosacea, eczema, urticaria, etc., when connected with menstruation. Munk found it

effective in restraining hemorrhages following the extraction of a tooth, inserting a tablet in the cavity. He suggests the same local application for the bleeding following circumcision. It is not, however, a local blood-coagulant, but a true hemostatic, acting by vaso-constriction of the small vessels.

Bloch recommends stypticin topically for parenchymatous bleeding from cavities.

Marcus found its internal use ineffective in checking bleeding occurring in dental cases, but the direct application never failed, besides being painless. Hulisch testifies to the efficacy of stypticin applied locally, in dental work upon notorious hemophiliacs. Munk found 10 per cent solutions strikingly successful in checking epistaxis, and Jahl succeeded in the same cases by applying stypticin gauze.

Among the authorities who have reported favorably on the hemostatic property of stypticin are Boldt, McGee, Gottschalk, Nassauer, Gærtig, Bakofen, von Braitenberg, Bossi, Freund, Nedrodow, Pazzi, Paoletti, Zaramella, Heyden, Abegg, Walther, Lavialle, Ruyssen, Munk, Bloch, Jahl, Marcus and Hulisch.

NICKEL BROMIDE.

Standard granule—Gr. 1-6, gm. .01.

Nickel bromide is a deliquescent salt, of greenish color. It was introduced to afford the benefits of the bromides in a small dose. In effect gr. 1½ equals half a dram of potassium bromide.

Da Costa employed nickel bromide in epilepsy with success. Hare recommends it in melancholy and hysteria.

In large doses Cushny ranks nickel with cobalt as a poison.

Like the other bromides this sedates the functions of the brain, dulls the sensibility of the faucial mucosa, and allays irritability of the sensory nerves. It sedates the sexual function without destroying desire, rendering erection impossible. A like influence is exerted on the ovaries. The reflexes are sedated, motor power diminished, and the vascular tension relaxed. The heart is slowed and weakened, but not as much as by potassium bromide. Very large doses slow the respiration and lower the temperature. Cerebral anemia is produced, according to Hammond. As a mild and harmless sedative the bromide of potassium has been employed to an enormous extent of late; and yet beyond a limited field there is no evidence of its usefulness. Tons of this drug have been administered as placeboes,

or with very little idea as to its effects beyond a temporary masking of symptoms by lowering sensibility.

Therapeutics.—Cerebral fullness and irritability in children are relieved by a few small doses of bromide; but as these usually come from some irritating substances in the alimentary canal, the old practice of administering a dose of ipecac or of castor oil, though less pleasant, was indubitably more efficacious and rational.

In the grave cerebral and meningeal inflammations we have never witnessed any benefit from the enormous doses of bromide usually given. Purging and vascular sedatives are immeasurably more effective; followed by absorbents. In exophthalmic goiter veratrine is better; with cicutine hydrobromate. When goiter coincides with irritation of the genital apparatus the bromides will give temporary relief. But there are few more objectionable practices in modern medicine than the drugging down the sensibility by bromides. Much better find the causes of irritation and remove them. And it cannot be without harm that a drug which so markedly depresses the sexual power, that index of the vital force, is given so freely and continuously as this. The practice of medicine teaches the lesson of using every possible means of increasing and cultivating the vital forces; and the use of depressants beyond temporarily, is a bad tendency.

In epilepsy the bromides have long been relied upon by the profession to such an extent that the routine consists in giving enough to ward off the paroxysms, and neglect every means of ascertaining and removing the causes of the malady. Sometimes it requires huge doses to do this—the writer has given an ounce of potassium bromide a day for 17 months to an epileptic. But it is better to give nickel bromide up to 10 grains a day, then if the fits continue add arsenic bromide to strengthen the bromide effect and prevent acne, and the other small-dose bromides, of gold, mercury, cicutine, etc., till the fits cease. Meanwhile the sources of morbid irritability are to be found and removed. This offers a better prospect of cure than the senseless drugging with bromides in vogue.

When it is desirable to reduce the sexual ardor, the bromides may be given freely; though gelseminine, salicin, and the sulphides, accomplish this object at least as well.

The authors do not approve of long continued bromidizing, and hence there is no danger in using nickel. The dose of nickel bromide for an adult is one to five grains, and up to 15 grains a day.

NUCLEIN.

Standard tablets—Gtt. 1-2, and gtt. 2. Nuclein Solution.

Nuclein can be and often is obtained from the egg, the spleen, the thyroid gland and other portions of the animal economy, but as a matter of uniformity and to avoid danger from decomposition it has been found better to procure it from live cereal germs, involving, however, chemical processes requiring much time and labor.

Physiologic Action.—When administered hypodermically, nuclein promptly produces a rapid increase in the number of leucocytes; this increase varies somewhat with the subject and the disease from which he suffers, but in all cases there is a most decided augmentation. The polynuclear cells are particularly affected. These cells, as has been shown by Metchnikoff, are the most active of the phagocytes. That the bactericidal power of the blood serum when free from corpuscular elements is due to nuclein is unquestioned; this nuclein is found free in the blood and is supposed to be secreted by the leucocytes. The administration of nuclein has been shown to increase this bactericidal power of the blood many fold. The effect of a dose passes away in from thirty to forty-eight hours, hence the necessity of continuous administration. Care, however, should be exercised not to overwork and therefore exhaust the cells. In some cases the exhibition of large doses at longer intervals is better than the continuous use of smaller quantities.

Briefly, the whole practical basis of nuclein therapy is the increase of leucocytosis: By its administration we obtain an increase in the phagocytic action and furthermore add to the number of these natural defenders of the body's health. When the system becomes so depleted by disease and the presence of morbid germs that cell repair is hindered or stopped altogether, we are face to face with a condition that has baffled science throughout the history of intelligent medication. Now the discovery of nuclein enables us to so stimulate cell-formation and phagocytosis that the *materies morbi* is surrounded, consumed and thrown out of the body as waste while at the same time the normal restoration goes on.

Therapeutics.—In all cases of infection of the system as well as in all anemic and chlorotic conditions nuclein will prove invaluable. If given per os it is well to give it on an empty stomach and to give no water following so as to secure quick absorption from the buccal mucous membrane and stomach. In phthisis its administration is followed by a prompt fall in the temperature and a general amelioration of all symptoms. Indolent ulcers take on a new aspect and as

granulation progresses normally and rapidly, are soon healed. In typhoid, and other diseases where marked deficiency of leucocytic action is evident it is an invaluable adjunct to all treatments, and the worst of these will produce better results with nuclein than the best without it. In malarial dyscrasias, in intestinal and gastric difficulties and in fact in all forms of disturbed metabolism (and therefore faulty cell repair) this agent should be used freely. The list if carried out would thus embrace all conditions of lowered vitality, the acute infections, such as diphtheria, tonsillitis, typhus and all the exanthemata, most disorders of the liver and nearly all the diseases of the skin.

When administered in doses of from two to ten drops of the medicinal solution it soon causes a feeling of stimulation and well-being and many a time improvement has been manifest from the very first dose.

In the following list of diseases to which nuclein is applicable, we present a few hints that we trust will be helpful and incite to fresh study.

Anemia. Here the dose of nuclein must be reasonably small. It has been demonstrated that if administered in five to ten drop doses, two or even three times a day, there is a rapid increase in the red blood corpuscles, but if larger doses are taken and oftener and continued for some time, then there is almost as rapid decrease. Anemics are as a rule always constipated.

Arthritis calls for nuclein, more especially in those patients who have through prolonged uric-acid poisoning become anemic. Salicylic acid may be used locally with advantage and the emunctories should be kept open.

Asthma cannot be per se controlled by nuclein, but its exhibition gives the patient a better systemic condition and thus enables him to throw off the disease more easily under appropriate treatment. This consists to a great extent of elimination and cerebro-spinal tonics. The attacks are controlled usually with glonoin, or apomorphine, strychnine, hyoscyamine and glonoin one granule of each dissolved in a little hot water and given every ten or fifteen minutes. Iodized calcium should also not be forgotten; in fact, it is clearly indicated in most cases.

Bronchitis in all its forms responds quickly to nuclein medication. The prompt use of iodized calcium with tonic treatment is suggested as abortive.

Bronchopneumonia. The dose of nuclein should be large, ten

to twenty drops given hypodermically every four or six hours. Strychnine and arterial sedatives in the early stage. When there is capillary involvement the use of potass. bichromate is followed by prompt improvement. Emetine and brucine are the drugs that prove most efficacious in children's cases.

Cancer. Nuclein in many instances has brought about a marked improvement and when combined with condurangin is perhaps one of the most reliable remedies that we possess. Full dosage—preferably hypodermically—for a prolonged period, and in the periphery of the growth, gives best results.

Cholera infantum in its early stages is controlled beautifully by small doses of atropine, copper arsenite and nuclein. The latter is best given here in solution which can be dropped on the child's tongue.

Chorea. In this disease the most beneficial results have followed full doses of nuclein given for a prolonged period, the Triple Arsenates with Nuclein being usually a good form.

Debility, general and senile, naturally calls for nuclein, but it must be given more as an adjunct to strong and prolonged tonic treatment; the use of nutritious, easily-digested and sometimes predigested food should, if nuclein, strychnine and arsenic are exhibited, soon cause any weakness to vanish.

Diabetes mellitus has been influenced most favorably by nuclein. If the proper diet is ordered and arsenic and gold bromide are exhibited, together with hypodermic injections of increasing doses of nuclein every day there is no question but that a fair percentage of cases will go on to cure.

Diarrhea, when it assumes a chronic type, leaves the system in just that condition which calls most imperatively for nuclein. Its administration should be begun early and with it strychnine, hydrastine and the Intestinal Antiseptics (W-A) should be given. Small doses of a saline laxative are often called for, but its use must be determined by the type of case. The acute form needs small doses of calomel followed by a saline and after the bowel is thoroughly emptied, the intestinal antisepsis.

Diphtheria. In this dread destroyer of the little ones the doctor who does not use nuclein and peroxide of hydrogen and calcium sulphide is open to defeat. Here as in other diseases it is important to have an exaggerated leucocytosis present and as already pointed out the larger the dose of nuclein the more rapidly can this condition be produced. The solution should be injected promptly in

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fifteen or even thirty-drop doses repeating every six or eight hours for the first two or three days; after that it is safe to continue the medication *per os*. Peroxide of hydrogen must be used freely and usually pure, the fauces and nasal passages being flushed with it constantly. Calcium sulphide should be given to saturation, and iodized calcium should be exhibited in five-grain doses t. i. d. The heart needs sustaining with strychnine and cactin, the former being replaced in the case of very young children by brucine. Elimination must be kept up.

Dysmenorrhea cannot naturally be influenced directly by this remedy, but the patient will be benefited generally and the doctor will have better material to work upon if nuclein and the tonic arsenates are exhibited. Here, too, watch and see that elimination is kept up.

Eczema and nearly all skin disorders are the outward manifestation of a general bodily dyscrasia and nuclein will prove of great benefit. There are but few forms of skin disease—if indeed there be any—which will not yield sooner or later to thorough and continuous elimination, blood building and an aseptic bowel.

Exanthemata. In all the eruptive diseases the administration of nuclein is of great benefit. It makes no difference how the case is treated otherwise, the addition of nuclein *per os* or hypodermically will prove of benefit. The one point that needs attention is the dosage. The small dose, *per os*, in the early stages once or twice daily, and in latter stages of a severe or badly-treated case full doses hypodermically give best results. Calcium sulphide, tonics and always elimination are also indicated.

Exophthalmos is another disease which in its early stages yields with marked rapidity to nuclein hypodermically. In these cases there is always a defective metabolism together with more or less nervous irritation. Iodine is, unquestionably, next to nuclein the remedy of choice and the best form in which to exhibit this drug is calcium iodized. Mercury biniodide, applied externally by inunction and taken internally in minute dosage, has warm advocates as also has phytolaccin.

Fever. The best treatment is to administer one of the arterial sedatives, aconitine, gelseminine or veratrine, in small, frequently-repeated doses, support the heart with digitalin or strychnine and, at the same time, aid elimination. Given in moderate dose nuclein promotes oxidation, favors the elimination of waste and all deleterious products and, finally, and most important of all, stimulates the

phagocytes and enables these soldiers of the system to surround and destroy the invader.

Influenza (la grippe) is again but an evidence of cell disturbance and retention of toxins. Clinical experience has demonstrated that the theory that here nuclein should be the remedy, is correct. After compelling free elimination see to it that the heart is supported with strychnine, etc., and the body rendered an unfertile and uncongenial field for the influenza bacillus by saturating the patient with iodized calcium, and finally, with nuclein, aid in the restoration of normal cell function.

Pharyngitis (Follicular) is readily controlled by nuclein through its action on the body secretions, but with it should be given calcium sulphide to saturation (especially in the beginning) and hourly doses of potassium bichromate, gr. 1-67.

Phthisis. It would be really repetition to point out the indications for the use of nuclein in phthisis. Be the general treatment what it may, there is only one remedy which can possibly restore cell-activity and that is nuclein. The dose should be carefully gauged; five drops every day will do at first but this should be gradually increased as necessity may arise. The best effects have been obtained from daily hypodermic exhibitions.

Rheumatism. The main effort should be to get rid of the toxic matter in the system at the time and prevent, by improving the general *tonus,* the manufacture of more. Calcalith, colchicine and salines are *the* agents *par excellence* with which to "clean out" and, after this has been done, then nuclein is the remedy with which the patients' condition may be rendered somewhat more nearly normal.

Tonsillitis and quinsy have been cured so quickly by the use of nuclein that its specific character in these diseases is generally allowed. As soon as the first symptoms appear, begin to administer small doses of calomel (say 1-6 grain every half-hour for eight doses), follow with a laxative and throughout give every two hours two drops of nuclein solution. After twenty-four hours the acute condition will as a rule subside, then the nuclein should be continued for a week, three times a day.

Typhoid. While this is to be treated generally as directed under the head of "Fevers," there are a few things to be remembered which apply here particularly. When nuclein is given in full dosage, along with intestinal antisepsis and free elimination, there is established, as has already been pointed out, an artificial leucocytosis,

with the result that in a few hours the entire character of the disease is changed.

Septicemia. In septicemia nuclein gives the most brilliant results. Wherever it is possible to get at and remove the source of the trouble the administration of nuclein with calcium sulphide and elimination enables the system to rally and dispose of the poisons which have already gained access to the circulation.

Struma. Strumous and rachitic children, generally intractible cases, will improve rapidly on nuclein and calcium salts with skin friction, exercise and proper diet. See that the alimentary canal is emptied and that the digestive processes are in good order.

Syphilis. In syphilis, nuclein and stillingin should be given to full effect together with mercury protoiodide; beginning with the latter in small doses and gradually increasing the dose to full tolerance.

During pregnancy the use of nuclein is strongly indicated and in the few cases where it has been used the results, both as regards mother and child, have been quite remarkable.

The aged benefit very much by full doses of nuclein given three times a day together with saline laxatives in the morning and two to three granules of the Trinity at bedtime. Nuclein is reconstructive, fortifying the body against rapid waste, hence the above indication.

In children of a dwarfish habit, or those who seem to be delicate without apparent cause, we are almost certain to find defective assimilation, both primary and secondary. Nuclein, with proper eliminative remedies, is indicated.

Administration.—Hypodermic Injection. In giving nuclein hypodermically it is imperatively necessary that not only shall the syringe and needle be sterile but that the skin itself shall be surgically clean. The most satisfactory plan to follow is this. Use only a solid metal or glass syringe. The whole syringe should either be soaked in alcohol or boiled for a few moments. While this is being done the skin over site of puncture should be washed with ethereal soap or plain soap and water and then sponged off with alcohol or ether. Now with a five per cent solution of carbolic acid go over the spot again and finally dry with sterile, absorbent cotton. Cover the area with a wad of this while getting ready to inject.

Having wiped off the syringe with cotton (sterile), draw up the amount of nuclein you propose to inject from the bottle direct and

if for constitutional effect add at least an equal quantity of distilled water, but if for local—as in cancer, etc.—inject pure.

See that the fluid is well up to the point of needle before injecting and after ejecting a drop wipe off the needle with cotton soaked in alcohol and with a firm hand push it well home under the skin. Inject the nuclein slowly, withdraw the needle and seal the puncture with a touch of collodion.

If these measures are taken you will never have the chill or flushing which some practicians claim follows the injection of nuclein. This simply means that some septic matter was injected with the nuclein and as some of the preparations are from animal matter it is easy to see how a mild septicemia can follow the use, without aseptic precautions, of such a nuclein solution.

Dose of Nuclein By Mouth. There is something in the manner of exhibition. When a rapid and marked leucocytosis is desired the dose should be ten, fifteen or twenty drops and repeated every three or four hours. If, however, the general tonic and sustaining effect of nuclein is desired the dose should be small, five drops being the maximum—and this should be given not oftener than three times or better twice a day. One thing has been proved by experience and this is that nuclein should not be taken within an hour of eating. The best time is when the stomach is most nearly empty, as absorption is more rapid and complete and there is not the probability of chemical change taking place. When the digestive function is active there is an undoubted loss of effect.

PAPAYOTIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

From the pawpaw, Carica papaya, is derived an enzyme, papayotin, which has the power of digesting all the elements of a meal, fat, starches and albumin. It forms peptone. It acts at any temperature, and in either acid, alkaline or neutral conditions, though it acts more quickly in alkaline solutions. It has no action on the body when taken into the stomach, simply digesting the food and nothing more. Its powers as a universal digestant of all forms of food render it widely applicable. It has been proposed to utilize it to digest intestinal parasites, but this seems still doubtful. It has been injected into tumors, where it forms peptomes, but the utility of the procedure has not been proved. Solutions will dissolve the membrane of croup and diphtheria, but the malady is not affected. In-

jected into the blood it paralyzes the heart and nerve centers, and causes intestinal hemorrhages. In the subcutaneous tissues it causes great pain and inflammation, with high fever.

Finkler credits papayotin with antiseptic powers, and Shoemaker says it can be given with salol or weak solutions of corrosive sublimate. Dr. E. A. Wood praised it as an application in ozena, tuberculosis of the larynx and lungs, etc. It has been urged as a galactagog, and to dissolve cerumen from the ear. Sittmann reports its value in diarrheas due to indigestion, and acute gastritis. It has proved useful in dilatation of the stomach.

The dose of papayotin is a grain before or with the beginning of each meal. As with the other artificial digestants, the benefit is less in the quantity of food digested by it than in the starting up of the digestive process. The great value of papayotin lies in its power to aid in indigestions of all forms, whether of fats, starches or albuminoids. Add to this that it is not so liable to decomposition as the animal products like pepsin, and works irrespective of its surroundings, whether acid or alkaline.

PEPSIN.

Standard granule—Gr. 1-6, gm. .01.

The pepsin of the shops is obtained from the stomach of the pig. It acts only in the presence of hydrochloric acid, the best results being obtained from solutions containing 0.2 per cent of acid. It digests only proteids. In very many cases where pepsin has received credit it has been due to the acid alone. There is often a deficiency of acid when pepsin is secreted in abundance. Cushny therefore limits the use of pepsin to cases where proteids are not digested even when enough acid is present. Pepsin wines are believed to be inert, but it requires a stronger alcoholic solution to destroy its proteolytic power. The presence of superfluous peptones in the stomach at the end of digestion prevents the action of pepsin. Alkalies are incompatible with pepsin; mercury, lead, zinc and copper prevent the action of pepsin by precipitating it. Tannic and gallic acids, creosote and phosphorus are also incompatible. Strong alcoholic fluids also interfere with its action.

In addition to its uses in indigestion of albumen, pepsin has a certain therapeutic power peculiar to itself. It has long been known that preparations containing it are effective in allaying irritation of the stomach, the vomiting of pregnancy, sea-sickness, etc.

The average dose of pepsin for an adult is a grain at the end of each meal, with a due addition of hydrochloric acid.

PHYSOSTIGMINE.

Standard granules—Physostigmine salicylate, gr. 1-1000, gm. .0000625; gr. 1-250, gm. .00025.

Physostigmine is an alkaloid derived from the Physostigma venenosum, the ordeal bean of Calabar. The plant contains at least two other alkaloids, calabarine which resembles strychnine, and eseridine which acts like physostigmine but is milder.

Physiologic Action.—Physostigmine resembles pilocarpine in action. It depresses the nerve centers, and kills by paralyzing the respiratory center. Consciousness is intact after the respiration is gravely affected and the muscular force weakened. Some preliminary stimulation is probably induced. Muscular twitching occurs, and the irritability and power of the muscles are increased by moderate doses. The respiration is at first faster, then becomes slow and weak. Small doses slow the pulse and raise vascular tension, larger ones slow the heart still more and the pressure falls. The action on the heart is direct, not through inhibition. It produces powerful contractions of the stomach and intestine, and increases all the secretions—tears, saliva, perspiration, mucus and pancreatic juice. It causes contractions of the bladder, ureter, uterus and bronchial muscular structures. It contracts the pupil but accommodates the eye for near vision.

Harnack holds that physostigmine acts on the secretory gland cells and on the muscular fibers; but others believe that it acts on the nerve-ends in these structures.

Physostigmine is eliminated mainly through the kidneys, appearing a few minutes after ingestion. Traces appear in the saliva and the bile.

Van Renterghem took during a day about gr. 1-22 of Merck's pure crystallized physostigmine. He experienced a peculiar sensation in the throat, as of a morsel that could not be forced down except by repeated strong efforts. This began five minutes after each dose and reached its maximum of intensity in half an hour, disappearing within three-fourths of an hour. As this effect was uniformly experienced he attributed it to local action. No other effect was noted but a slight diminution of the appetite. Next day he took about gr. 1-20, in divided doses, gr. 1-100 every hour. By noon he

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felt slight vertigo; with little appetite. Little by little the malaise augmented; in the stomach a sense of spasmodic non-painful movement; no nausea; firm stool with discharge of urine; more vertigo, face pale, whole body cool without shivering, nails blue, sweat on forehead and over face; fatigue; easier half lying down. At 12:30 energetic intestinal peristalsis, stool, followed by three vomitings, not preceded by nausea. No bile thrown up. Slight desire to sleep; no more vertigo but felt cold; pulse normal at 76 to 82; now 64; axillary temperature 36.8 C. No ocular symptom. By 2:30 all had subsided, heat returned, temp. 37.1, pulse 70. At 3 p. m. resumed taking physostigmine gr. 1-300 hourly till 10 p. m. Dined at 5, little appetite, frequent urination, no other effect. At the hour of retiring the pulse was 76, temp. 37.4 C. A good night.

Therapeutics.—As a depressor of the cerebrum it has been used in epilepsy but under its use the paroxysms increase in frequency and violence. In chorea the same result has been recorded. It has failed also in tetanus. In flatulence it is one of the most efficient remedies at our disposal, and has never failed the writer. In cases of chronic morphinism when the cheek shows a dusky flush, the capillaries passively dilated, the brain probably in a state of passive dilatation of its capillaries, physostigmine in doses of gr. 1-100 hypodermically gives exactly the sensations of morphine, and the patient is unable to detect the difference. This has rendered this agent useful in the treatment of such cases. The dose must not be repeated more than once in twelve hours, or increased, or the depressing effects of the drug become manifest and it does harm.

Physostigmine has been utilized by ophthalmologists to contract the pupil, oppose the effects of atropine, and in treating glaucoma.

Van Renterghem cites many cases in which tetanus was cured by physostigmine, even tetanus neonatorum. It is not a remedy for strychnine poisoning. Animals fed with both die sooner than when strychnine alone has been administered. Subbotin found it useful in fecal impaction, and with belladonna and nux it has become a common prescription for constipation. Maschka cured a case of diarrhea with flatulence, due to intestinal catarrh, by the use of physostigmine.

Poisoning by Calabar bean is treated by evacuating the stomach, atropine enough to antidote the toxic effects, and supporting measures. Atropine antidotes physostigmine more effectually than physostigmine does atropine.

Van Renterghem recommends doses of gr. 1-250 to 1-134 of physostigmine salicylate or sulphate to begin with.

The daily dose of physostigmine should not exceed gr. 1-50, divided, for an adult.

PHYTOLACCIN.

Standard granule—Gr. 1-6, gm. .01.

Phytolaccin is a concentration from Phytolacca decandra, or poke.

The chemistry of this plant is obscure, a number of active principles having been assigned it, but none of them has been placed on the market or shown to represent the virtues of the plant. Our most voluminous information concerning it comes from the eclectics.

Felter and Lloyd say that phytolacca acts upon the skin and the glands, especially those of the mouth, throat and sexual apparatus, and most markedly on the breast. It also acts on the fibrous and serous tissues and the digestive and urinary mucosa. It is eliminated mostly by the kidneys. It slows the heart and reduces its force, as well as that of the respiration. It paralyzes the cord, acting principally on the medulla. Tetanic convulsions are produced by toxic doses. Death results from paralysis of respiration. In full remedial doses it acts as an emetic and drastic cathartic, the vomiting preceded by an hour of suffering. The subsequent purging lasts long. Large doses cause violent emeto-catharsis with muscular paralysis, occasionally spasms, and frequently tingling or prickling. Dimness of vision, diplopia, vertigo and drowsiness are caused by large non-fatal doses.

Therapeutics.—Phytolacca is emetic, cathartic, narcotic and alterative, advised for dyscrasia, scrofula, syphilis, chronic rheumatism; relieving osteocopic pains better than opiates; destroys the itch acarus; is called for in indolent states of the skin with vitiated blood; chronic eczema, syphilides, psoriasis, tinea capitis, scaly, vesicular, pustular or tuberculous eruptions, varicose and other leg ulcers; with iridin in sycosis, fissures, fistulas, boils, carbuncles, dermal abscesses, and ulcerations at the outlets of the body; tracheitis, laryngitis, influenza, catarrh, especially with diphtheritic tendency; tonsillitis, follicular pharyngitis, stomatitis, aphthae, nursing and ordinary sore mouth, and syphilitic faucial ulcers; non-malignant diphtheria; chronic tonsillar hypertrophy; goiter, ozena and nasal catarrh; pharyngeal coughs; the best remedy for hard

lymphatic enlargements; acute mastitis, parotitis, metastatic mumps, orchitis, sore nipples, the tenderness of the breasts that occurs during menstruation, ovaritis, lymphoma, subinvolution, uterine and vaginal leucorrhea, felons; gastric and intestinal glandular ulcers; gonorrhea and nocturnal irritability of the bladder; conjunctivitis, gonorrheal, syphilitic and simple; piles; hydrophobia; angina pectoris; many headaches; asthenic hyperemia of spleen, liver or uterus; albuminuria; with iridin in abdominal tuberculosis; obesity; fatty heart if rheumatic; locally for cancer and ulcers.

Specific indications.—Pale mucosa with ulcers; sore mouth with small blisters on tongue and buccal mucosa; white sore lips, epidermis separating; hard sore enlarged glands; mastitis, orchitis, parotitis, aphthae; sore breasts with impaired breathing; faucial, tonsillar or pharyngeal ulcer; pale sore throat with cough or respiratory disease; white glaze over mouth, in children; white pultaceous sloughs at mouth corners or in the cheek, and diphtheritic deposits.

In case of poisoning by this plant, the treatment consists in emptying the stomach, and keeping up the respiration by hypodermics of strychnine.

Ellingwood advises phytolacca in the angina of scarlet fever, abdominal pains increased by pressure, rectal ails, gastric headaches, the irritation from teething, and in pains in the liver with enlargement and induration so that the patient cannot lie on the right side; spasmodic and membranous croup, and in neuralgias.

The great repute in which phytolacca is held was originally based on its remarkable action in mastitis. Many times the writer has applied to the inflamed breast of the parturient woman the extract of this plant, with excellent effect. But as it acts through absorption it is better to give it internally, in small and frequent doses. Give gr. 1-6 to j repeated every half-hour till slight nausea begins to be felt, and then less frequently. Support is better than any remedial drug locally. Do not let the nurse rub the breast—it is sore enough already.

As a remedy for obesity phytolacca owes its repute to advertising.

PICRIC ACID.

Assuredly, picric acid must have friends, for it continually bobs up as a remedy for something, and will not stay buried. Generally

it is as a remedy for malaria internally, or for burns externally. Let us see what there is to be said of it.

Picric acid, trinitrophenol, $C_6H_3(NO_2)_3$, is obtained by treating phenol with nitric acid. It is slightly soluble in cold, more freely in hot water. It is very bitter. It imparts a yellow color to the tissues, urine, skin and eyes, which is removable (when locally applied) by alcohol, boric acid, or strong soap.

Erb credits it with causing nausea, vomiting, diarrhea, emaciation, and strongly affecting the red blood cells.

King says overdoses cause extravasations of blood under the intestinal mucosa, with flatulence, depression, twitching of the muscles.

Ellingwood adds to the list of toxic effects lowering of temperature and blood pressure, respiration becoming shallow, heart weak and rapid, painful diarrhea and collapse. Sometimes convulsions precede death. The leucocytes are increased in number.

Therapeutics.—Picric acid has been frequently recommended for malaria; reports as to its efficacy vary. King limits its use to cases where quinine has failed or ceased to be beneficial. He speaks of it as a tonic-astringent, useful in convalescence from acute fevers, in headaches, chronic diarrheas, gastric irritability from dyspepsia, anemias, etc. Ammonium picrate is preferable to the acid, as the latter is apt to cause cramps. In malarial debility it has proved useful, also in bilious diarrheas, and as a sedative to spasmodic coughs, either whooping-cough or persistent dry hacking with dry tongue and throat (Ellingwood).

Webster recommends picric acid in pernicious anemias and leukemia, giving very small doses.

Clark found this agent useful in malarial neuralgias, but that it was liable to cause urticaria. The yellow tint of shoe-linings is due to picric acid, and this has given rise to painful dermatitis, with vesication.

Shoemaker speaks of the application of a 6 per cent solution for erysipelas. A saturated watery solution—about ½ per cent—has been often applied to burns of the first and second degree, on compresses. As it dries, the same solution should be employed to moisten the dressings before removal, to avoid injury. It is also applied in ointment of 1 to 2 per cent.

Quinquaud applied this acid in epithelioma; while Calvelli advised it in chronic eczema, in solution of 1½ parts in 250 of distilled water.

It should not be applied to extensive burns, as it will cause toxic effects by absorption.

King gives the dose of picric acid or its salts as gr. ½ to 1, three times a day. Ellingwood gives that of ammonium picrate as gr. ⅛ to ½, while Shoemaker puts it at gr. ½ five times daily.

The acid has failed as a remedy for trichina and intestinal worms, and Adler tried it as a surgical dressing and condemned it.

The important point in all this is the use of this remedy in cases of malaria that have resisted quinine, and where the latter has lost its good effect. When a new remedy is tried in such conditions and proved beneficial, it is sure to be lauded as superior to the ones formerly used; when in point of fact it may only be of use in the exceptional cases, or when the worst of the attack is past. Thus the iodides acquired an undeserved repute in rheumatism, where they are only of value in the subacute stages; and copaiba forms the basis of cough remedies that succeed "when all others fail," because that brings the case along to the stage at which copaiba is of use, and if given too soon it can only do harm.

The picrate of iron may be used when the anemia indicates that metal, in doses similar to those of the ammonium salt.

PICROTOXIN.

Standard granule—Gr. 1-134, gm. .0005.

Picrotoxin is a glucoside from Cocculus Indicus or fish berries. It has some relations with the digitalin group, for they slightly stimulate the areas around the medulla, while the picrotoxin group do the same thing more powerfully, though they do not affect the heart and vessels as digitalin does.

Picrotoxin may cause vomiting, or salivation, fast pulse and respiration, or slow pulse and palpitation. Stupor and unconsciousness follow and then strong convulsions, tonic and then clonic, affecting the limbs and jaws. There is an arrest of breathing during the spasms, which alternate with periods of quiet. If death occurs it is from asphyxia.

The action is exerted mainly on the medulla, the cerebrum and cord being unaffected. The heart is slowed by stimulation of inhibition mainly, in part by direct action on the heart. The marked rise in vascular tension is also due to centric stimulation. The acceleration of respiration is likewise due to centric stimulation. Near death the breathing may become slow and labored. When given in

doses too small to cause convulsions picrotoxin lowers the temperature. Its mode of excretion is unknown.

Picrotoxin is antidoted by chloroform and chloral; and when the respiration is weakened by chloral, picrotoxin restores it, raises the blood pressure, and cuts the sleep short. It may possibly antidote morphine.

Fish berries are so called because they are employed to catch fish. The powder is mixed with bread and dropped in the water; fish swallowing the dose are temporarily stupefied and float on the surface of the water. Consciousness is soon restored and the flesh does not become toxic to the eater of the fish. A tincture of cocculus is also used to destroy lice. Death has occurred from this application. Cocculus is also employed as an adulterant of beer.

Like pilocarpine picrotoxin stimulates the secretions and is antidoted by atropine.

Therapeutics.—Picrotoxin has been recommended as a tonic in dyspepsia, with torpid intestinal walls; it relieves flatulence and colic; gastralgia, nausea, dizziness and other symptoms of poor digestion. It has been used with success in epilepsy, chorea, alcoholic tremor, shaking palsy, migraine, dysmenorrhea, etc. Anemic nocturnal epilepsy is especially benefited by this remedy. Profuse sweating sequent to influenza was checked by it (Semmola). Murrell recommends it in the night-sweats of phthisis in doses of gr. 1-67 at bedtime or three times a day. It succeeds when even atropine fails.

The most obvious use of picrotoxin would be as a respiratory stimulant but this appears to have been neglected. As a substitute for pilocarpine it would be of use in many instances, the dose being smaller and the price much less.

The dose of picrotoxin is gr. 1-67 three times a day, or half this every two hours till effect.

PILOCARPINE.

Standard granule—Gr. 1-67, gm. .001.

Pilocarpine is a liquid alkaloid derived from Pilocarpus microphyllus, or jaborandi. This exists in the plant in combination with at least three other alkaloids, jaborine, jaboridine and pilocarpidine. Of these one possesses in a lesser degree the qualities of pilocarpine and the others oppose this action through its whole range. The relative proportions and actual quantity of these varies in the plant under the various conditions under which it grows, and which group prevails

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is a matter to be determined by experiment. It was a case of this that first led the writer to the study and use of the alkaloids. Attending a woman in confinement, she had too little milk for her babe, although fully strong enough to afford it a full supply. The fluid extract of jaborandi was given her to increase the flow of milk, but next day she had none at all. The physician charged the druggist with having made a mistake, the druggist passed the charge along to the manufacturer, and he to his employees. At that time the chemistry of the plant had not been studied sufficiently to show wherein the trouble lay.

Physiologic Action.—In medicinal doses pilocarpine causes in fifteen minutes flushing of the skin, and either salivation or sweating. Weakly persons, as victims of organic heart disease with failing compensation, are more apt to have salivation; the more robust the patient the more likely to sweat. The sweating from a full dose is very profuse indeed. The discharge contains an increased quantity of the solid constituents of the perspiration as well as the water. It includes urea also. The vascular pressure falls and the temperature if above normal falls from 1 to 4 degrees. Reichert found that the production and the dissipation of heat were at first increased and later decreased by pilocarpine. Nearly if not all the secreting glands are similarly affected. The gastric and pancreatic secretions are largely increased, the bile less so, the tears, milk and bronchial mucus augmented—so much so that full doses have been followed by pulmonary œdema.

The discharge of urea by the kidneys is increased, but the water is lessened by the loss through other channels. If given in doses too small to cause sweating, however, pilocarpine increases the urinary flow. It contracts the uterus so strongly that abortion may result. It reduces the size of the enlarged spleen. Children are less susceptible than adults and more apt to show the salivary effect, especially if less than four years of age (Demme).

Remy tells of one case in which a series of epileptic attacks followed the use of this agent. Sudden death ensued in another case.

The writer once gave jaborandi to a puerperal woman to increase the production of milk. She was a very large, portly woman, strong as a horse, but accustomed to the daily use of beer in moderation. In this instance the jaborandi increased the secretion of milk satisfactorily, but in a few days the patient requested the physician to have her confined in an asylum for the insane as she could not much longer resist the impulse to kill her husband with an axe. The

jaborandi was discontinued and the homicidal impulse subsided. The milk also ceased entirely, as had been the case at each previous accouchement.

This case was published, and some years later a Russian journal published a report from a physician in Siberia, detailing a similar case, and quoting that recorded by the writer. Yet this does not appear to be a direct action of the drug, but for some unknown reason this woman could not supply her children with milk, and if any other means had been employed that would have induced a secretion of milk the same mental condition would have supervened.

Van Renterghem says that pilocarpine excites the peripheric terminations of the pneumogastric. (The statement in Shoemaker that it paralyzes this nerve must be a misprint.) He truly places the beginning of its notable action at three minutes from the time it is injected subcutaneously. Cerebral tension is felt, with throbbing arteries. The sweating ceases within one hour, the salivation continues longer. If covered up in bed the sweating may last several hours. Some shivering may follow.

Robin found the average flow of saliva after pilocarpine to be 500 c. c. The sweat ejected is from 300 c. c. upwards—very far. During the action there may be thirst, anorexia, nausea, vomiting (rarely, and more apt to occur if the patient has eaten shortly before taking the pilocarpine, or if he swallows the saliva), slight colic or diarrhea. The desire to micturate becomes imperious, even painful. Thirst, anorexia, dryness of the skin and throat, fatigue and depression, persist some time after the sweating has ceased. At first the pulse gains 10 to 20 beats, subsiding towards the end of the sweating; the rhythm may be disturbed, if the heart is not sound. Arterial tension is but little lowered by strictly therapeutic doses. The pupil is contracted by the local application of pilocarpine. The intraocular tension is lessened. Not only is the intestinal glandular secretion increased but peristalsis is stimulated (Albertoni). The effect on the uterus is greatest at the end of pregnancy (Lavrand).

Six grains of pilocarpine were dispensed by mistake and taken in a single dose by an adult. The symptoms were enormous, but had subsided in four hours. The effects of this agent are attributed to a stimulation of the termini of the excito-secretory nerves; the substance intermediary between them and the gland cells (Vulpian).

Caustic alkalies, per salts of iron, metallic salts in general, are chemically incompatible with pilocarpine. Atropine is markedly antagonistic. Muscarine, nicotine, apomorphine, physostigmine and

picrotoxin, are to a greater or less extent analogous in their action with pilocarpine.

Therapeutics.—As a diaphoretic no known drug equals pilocarpine. In all pulmonary affections, acute, due to catching cold, a full dose of pilocarpine will often break up the attack if taken in time. In acute exacerbations of chronic respiratory affections, bronchitis, laryngitis, the debut of pneumonia, pleurisy, this medication is well placed. When the sputum is scanty and tough pilocarpine aids by inciting a freer secretion. In dropsies, whenever diaphoresis is admissible it is the most effective agent at our command. In nephritic cases it is equally available when uremia threatens, since it eliminates urea through the skin.

In the dropsy following scarlet fever pilocarpine has proved excellent. Cardiac dropsy does not come under its rule—weak hearts contraindicate it. In many skin diseases pilocarpine has been employed with varying results. As a remedy for itching it has no superior. The itching of jaundice is completely relieved except that due to cancer of the liver. The substitutive action of pilocarpine is often of value here, and the aid given the eliminants renders it useful in all cutaneous maladies traceable to the effort of the skin to supplement the action of kidneys unequal to their task. By this means we may obtain temporary relief and time to institute the methods that tend to cure by equalizing the tasks with the capacity.

The eruptive and other essential fevers may afford a field for this drug as yet unsurveyed. The writer has employed pilocarpine for twenty years as a specific for sthenic erysipelas without finding a case it failed to control. The first case was a stout Irish woman with facial erysipelas, bright red eruption, high fever, some delirium. Pilocarpine was given until slight action was noticeable, by which time the eruption had begun to pale and recede. When it had been reduced to an inch the medicine was suspended, and at once the erysipelas began to spread. Again and again the drug was given till nearly well, and suspended till the redness was evidently spreading, until we were completely satisfied that pilocarpine controlled that disease as we control a trotter with the lines. Then the medicine was given till the eruption had completely disappeared. This experience was repeated with every succeeding case of erysipelas for years, till we met a case of asthenic form, eruption pale, no fever, heart weak from fatty degeneration, whole system depressed. No tendency to sweating was manifest under pilocarpine, which depressed still more. This patient responded at once and strongly to

dram doses of tincture of chloride of iron every four hours. Since then the writer has met no case of erysipelas that did not quickly respond to pilocarpine if sthenic, and iron if asthenic.

We must emphasize the use of pilocarpine in the beginning of acute pleurisies. Empty the bowels freely and fully, give a full dose of pilocarpine, enough to cause profuse sweating, and forbid all food and drink. The blood vessels will be drained of serum, the surplus will flow out of the hyperemic capillaries, and the attack be jugulated. The same applies to all acute affections due to catching cold. The abstinence is essential.

Pilocarpine has been employed in several ocular maladies, subacute and chronic; as a myotic it is unequal to eserine; as promotive of absorption it is indicated in iridochoroiditis, and iritis serosa, glaucoma, detachment of the retina, etc.

Schuller reported some cases in which pilocarpine had strongly stimulated the growth of the hair, curing alopecia and restoring gray hair to its original color. Success and failure have been reported as to this suggestion, and as yet the proper cases for this remedy have not been differentiated.

So also in deafness—some cases have been cured by pilocarpine and others resist its influence—labyrinthine disease and dry catarrhs (Politzer).

Some cases of diphtheria have been recorded where the full effect of pilocarpine has been heralded by the separation of the membrane. But the depression is to be taken into account, and if used the remedy must be carefully watched. At present the use of antitoxin is preferable.

Mumps is often jugulated by this agent in full dose. In diabetes insipidus the flow of urine is quickly lessened by it. Hiccough, asthma, hysteria, hystero-epilepsy, mania, whooping-cough, amblyopia, amaurosis, opacities in the vitreous humor, otitis media, œdema of the glottis, the dry mouth of diabetes mellitus and that due to atropine, albuminuria of pregnancy, eclampsia, fulgurant pains of ataxia, hydrophobia, unilateral sweating, and the night sweats of phthisis, are some of the maladies in which this remedy has succeeded. It is one of the best and quickest means of breaking up the chill of malaria. A forming attack of influenza is quickly jugulated by a full dose of pilocarpine, enough to cause free sweating. This alkaloid has been advised for many forms of blood infection, by venomous insects, snakes, even for hydrophobia, and for the effects of such toxic plants as rhus toxicodendron. It has been

claimed that pilocarpine will abort an attack of gonorrhea if given at the beginning, before the discharge has become purulent. In all these affections a full dose is requisite, enough to cause free sweating or salivation. It is even advisable to give this remedy in this manner at the very outbreak of smallpox, scarlet fever and measles.

Pilocarpine is preëminently a remedy for the Burggraevian method of dosage. To an adult it should be given in hot water, in doses of gr. 1-67 to 1-33, repeated every five minutes till the desired effect is manifest. This avoids the danger or inconvenience of an overdose, and as the effects are as quickly shown as when given hypodermically, no time is lost. But when there is question of aborting a dangerous chill give gr. 1-6 by hypodermic. With children, heart cases and weakly adults, give only by the careful method first advised and watch closely. In erysipelas give till slight sweating begins and then enough to keep up this effect. For deafness, alopecia and chronic maladies in general, ascertain the dose requisite for full effect by cumulative administration, and then give this quantity in a single dose at bedtime thereafter.

PIPERINE.

Standard granule—Gr. 1-6, gm. .01.

Piperine is an alkaloid from Piper nigrum, black pepper. It is almost insoluble in water, soluble in 30 parts alcohol, 1 part boiling alcohol, very soluble in hot acetic acid, slightly in ether, soluble in chloroform, carbon bisulphide and benzole. When pure it is almost tasteless, on account of its insolubility; but in solution it develops the sharp pungency of pepper.

Like pepper itself, piperine causes a sense of warmth in the stomach, increases the appetite, the digestion, the secretion of gastric juice and the gastric and intestinal peristalsis. Overdoses cause gastroenteritis, as too long or concentrated applications to the skin occasion dermatitis. Doses of 37½ grains caused burning of the eyes, palms and soles, then in all the limbs, with alternate sensations of cold and heat, changing their location. Heart-action was not modified (Neumann and Chiappa). Mosler found that in dogs it caused a decided reduction in the size of the spleen, with slight fall of temperature. Although doubtless eliminated by the kidneys analysis has not detected piperine or the products of its decomposition in the urine.

Piperine has antimalarial properties and has been employed as a remedy for ague but is now used simply as an adjuvant to quinine.

It has also been employed as an internal remedy for hemorrhoids. Colics and diarrheas are relieved by it as by any carminatives; and it forms a valuable ingredient of the powerful mixtures employed to break up by local action the attacks of cholera, dysentery, and congestive chills. In scarlet fever it may be given to stimulate the vitality of the tissues of the throat. In chronic gonorrhea the local stimulus of this agent as eliminated by the urine may arouse the vital resistance to morbific action and thus promote a cure. It will be seen that except in ague the effect is that of a local stimulant and vital incitor; and it is questionable if the oleoresin of pepper is not a better remedy. The uses of piperine other than for this local action have never been studied.

Astringents render piperine inert.

Blom advised piperine in malarial fevers in phlegmatic subjects, with digestive torpor; finding it superior to quinine and to salicin in them. In catarrhal and rheumatismal forms it was contraindicated.

Several authors speak of piperine as stimulating the sexual appetite.

Burggraeve prescribed piperine for chronic discharges. Van Renterghem cured a case of gleet in three weeks with piperine, gr. ⅓ every hour. As a febrifuge the dose may be placed at a grain every hour for an adult. As a gastric stimulant give a grain before meals, to be chewed, not swallowed whole.

PODOPHYLLIN. PODOPHYLLOTOXIN.

Standard granules—Podophyllin—Gr. 1-67; gm. .001; gr. 1-12, gm. .005; gr. 1-6, gm. .01; podophyllotoxin; gr. 1-12, gm. .005.

Podophyllin is a resin derived from Podophyllum peltatum, the may-apple. It is soluble in alcohol, insoluble in water. It consists of an inert resinous acid and podophyllotoxin, a white, resinous amorphous powder, very bitter, soluble in diluted alcohol and in hot water. According to Podwissotzky podophyllotoxin consists of picropodophyllin, the true active principle, which is rendered soluble by the accompanying picropodophyllic acid. He therefore prefers podophyllotoxin as a remedial representative of the drug.

Felter and Lloyd pronounce podophyllum a certain but slow cathartic. Small repeated doses short of catharsis induce ptyalism. It increases the bile and intestinal secretions; causes griping, is aided by salt, and does not leave constipation in its wake. Large doses occasion violent emetocatharsis. Overdoses have caused

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death. When given unnecessarily to improper subjects it has occasioned gastroenteritis. The above named authors recommend podophyllum in syphilis, rheumatism and scrofula in doses too small to act on the bowels; atonic dyspepsia, gastric and intestinal catarrh, atonic indigestions, with dizziness, anorexia and heavy headache, indisposition to exertion, dirty flabby tongue, and fullness of the superficial veins, the abdomen and tissues in general; gastric disturbances due to torpid liver; chronic hepatitis; habitual constipation especially if due to portal engorgement (small and continued dosage); bilious and malarial fevers (not now so employed); in dropsy, with potassium bitartrate; dysmenorrhea, amenorrhea, incontinence of urine, worms and some affections of the bladder.

Specific Indications.—Fullness of tissues, especially of superficial veins; oppressed full pulse; dirty yellow tongue, and dizziness. Contraindicated by pinched features and tissues, contracted skin and tongue.

These authors treat of podophyllin under a separate head, as a distinct remedy. As a cathartic it requires 4 to 8 hours to purge, and the action may last two days. It maintains a constant moisture of the skin. Alkalies with aromatics check over-catharsis. Trituration with milk sugar increases its cathartic action and renders it less griping. Foods of difficult digestion should not be taken during its administration. Podophyllin is used mostly in small non-cathartic doses as a stimulant to the sympathetic nervous system; acting mainly on the parts supplied by the solar plexus. It improves digestion and blood-making, stimulating normal excretion. "It exerts a peculiarly specific action on all forms of stomach and bowel trouble with atony, characterized by full and relaxed tissues, with mucous discharge." In summer disorders of children, especially cholera infantum, with mucoid slimy stools; motion sluggish, tongue yellowish white, superficial veins full, face dull. In chronic maladies with feeble digestion, not responding to tonics, usually atony of upper small bowel; for constipation, costiveness of infants or aged; stools hard, grayish white or clayey, floating on water, also for dry stools with tympanites and wandering colicky pains; flatulent colic of children with constipation; dysentery and acute or chronic diarrhea with portal sluggishness, dyspepsia with thickened mucous tissues secreting freely, head full, tissues full and "doughy," veins same, skin sodden, tongue fully coated dirty; cardialgia with constipation; hepatic disorders, biliousness, dizziness, bitter taste, acholic stools, bilious vomiting; acute and chronic hepatitis, hepatic fullness, in-

frascapular aching, ache in back of neck, with dizziness; in jaundice with clayey stools alternate with chionanthus; biliary calculi; hemorrhoids dependent on hepatic torpor (alternate with sulphur); cough of bronchorrhea with gastric catarrh; heart disease with hepatic torpor; rheumatism when patient is sallow and inactive, with fullness of tissues, dull pain and heaviness in liver; in renal diseases with the usual indications present; pustular conditions, eczema and cracked or fissured skin (Ellingwood); deep-seated pain in sciatic notch (Scudder); non-intestinal inflammations with constipation; brain disorders and dropsy require large doses as derivative; in malaria alternate with cinchona; cathartic doses are necessary in biliary calculi, apoplexy, dropsy and some inflammations. Younkin advises them in gonorrheal epididymitis.

Ellingwood says this agent is indicated in inactive conditions of the gastrointestinal tract, heavily coated tongue, thick, broad and pale; dirty yellow especially at the base; perhaps vertigo, complete anorexia, and dull heavy headache; the circulation full and sluggish, abdominal viscera plethoric. Whatever the disease these conditions indicate the employment of this remedy. Always give in doses too small to develop the irritative or cathartic effect.

Cushny says podophyllotoxin causes glomerular nephritis and hemorrhages into various organs when given subcutaneously or intravenously in large doses.

Shoemaker recommends podophyllin in sick headache with loose dark stools; in recurring tonsillitis, etc.

Synergists are euonymin, leptandrin, iridin, which with quassin and caffeine have cholagog properties; purgatives all aid that action of podophyllin; atropine prevents griping and combats the intestinal spasm that hinders purgation.

As a purgative podophyllin is too slow and too violent for use when there are so many better agents of this class. The special indication followed by the writer for years has been its prescription when the stools are dark colored and offensive. Here the dose should not exceed gr. 1-12, given at bedtime, which will act in 12 to 14 hours. It may be repeated twice a week if needed. We never exceed that dose.

The uses of this agent in still smaller doses as advised by the eclectics quoted seem worthy of study and experimentation. Too often we base our ideas of a drug-action solely on its toxic effects and ignore the use of it in doses too small to develop such gross interference with the animal economy.

Podophyllin is variable in strength and it would be wise to substitute podophyllotoxin, which is uniform and the dose is smaller. The only reason this has not been done by American alkalometrists is that the podophyllin furnished the profession is so pure and uniform that the need for a better preparation has not been seriously felt. But if prescribed to be filled by the pharmacist from any podophyllin he may happen to have on hand, it would be better to substitute the more certain form of the drug.

The granules of podophyllin containing gr. 1-67 each are well suited for the uses described by Lloyd. One granule before meals and at bedtime, will suit most cases. The granule of podophyllotoxin is far too strong. One of gr. 1-67 to 1-134 would be quite satisfactory.

POPULIN.

Standard granule—Gr. 1-6, gm. .01.

Populin is a concentration from the bark of the white poplar, or American aspen, Populus tremuloides. Poplar bark contains two glucosides, populin and salicin.

Felter and Lloyd say that this bark is tonic and febrifuge, and has been used for ague with benefit. As a tonic it is employed for emaciation and debility, in convalescence; disorders of the reproductive system, impaired digestion, chronic diarrhea, and against lumbricoids; as a diuretic in urinary affections, gonorrhea, gleet, and for granular kidney. It is useful for irritable bladder with tenesmus, if given in very small doses. Webster suggests its use for uterine congestion and for hypertrophied prostate.

Specific Uses.—Marked debility with impaired digestion; tenesmic vesical irritation; tenesmus after urination.

The presence of salicin gives populin a sedative action on the sexual function and appetite which may be useful.

The dose is from gr. 1-6 to 1 before meals and at bedtime.

POTASSIUM BICHROMATE.

Standard granule—Gr. 1-67, gm. .001.

Potassium bichromate has been recommended as an alterative against scrofula and syphilis, but is now employed simply as a remedy for some respiratory conditions. The effects are said to be confined to the throat and bronchi, with the larynx, not extending to the bronchioles. Hoarseness and cough are the indications for its

exhibition. These may appear in laryngitis from strain or cold, diphtheria, croup, any inflammation of the region described with tendency to low grades of deposit. It has also been recommended for muscular pains, chronic non-febrile rheumatism, mucoenteritis and acute diarrhea occurring in cold weather (Webster); chronic diarrheas and dysenteries as a recuperative; and in dyspepsia with yellow coated tongue and gastric catarrh.

Specific Indications.—Respiratory irritation with hoarseness, harsh or croupal cough, scanty or thick tenacious sputa, difficult respiration, subacute inflammation; low grade inflammatory deposits; mucoenteritis and irritative diarrhea with tenesmus, dyspepsia with gastric catarrh and yellow tongue; corneal ulcers with stringy discharge, croupous conjunctivitis, trachoma with tenacious discharges; non-inflammatory rheumatic or muscular pain; pseudomembranous croup; laryngeal irritation and hoarseness from singing or speaking (Felter and Lloyd).

Shoemaker speaks of this as a remedy for tonsillitis where the onset is rapid, tonsils rough, raw and angry looking, with mucopurulent secretions exuding from the follicles, and in non-diphtheritic pseudomembranous tonsillitis; where Weaver considers it a specific.

Abbott recommends this agent as an expectorant, a relaxant in croup and capillary bronchitis, and says that in the third stage of pharyngitis it acts like a charm.

The dose is gr. 1-67 every half-hour to two hours; in croup and capillary bronchitis this dose every ten minutes, in hot water.

POTASSIUM PERMANGANATE.

Standard granule—Gr. 1-4, gm. .015.

When brought into contact with any albuminous tissue, permanganate of potassium loses a part of its oxygen instantly. This renders it destructive to the protoplasm with which it comes in contact. And the certainty of its decomposition the moment it touches the walls of the stomach has led many to deny the reports of its efficacy in anemic amenorrhea. Nevertheless there is abundant evidence as to its efficacy in this malady. No other preparation of manganese has won repute in this disease; but we have not been able to find any evidence that any other salt of this metal has been sufficiently tried.

A physician told the writer he had discovered a most valuable

remedy for phthisis; but that just as he had begun to see the cure of the cases within reach, they always were taken with serious or even fatal pulmonary hemorrhages. It was suggested to him that his remedy was potassium permanganate, and he acknowledged that this was true. The recognition was based on a belief in the power of this agent to induce hemorrhages where due and in these cases it was most likely to occur through the thin walls of the pulmonary capillaries. In amenorrhea the uterus is most apt to bleed, hence its effect in anemic amenorrhea.

Let the patient take iron arsenate during the intermenstrual period, beginning four days before the expected flow to take potassium permanganate in doses of gr. ¼ every two to four hours, and continuing till the discharge appears or the time is past. If it does not appear it is evident that the supply of blood is insufficient to afford the loss, and this must be made up by proper treatment and diet.

Potassium permanganate has been used with some benefit in diabetes mellitus, diphtheria, scarlet fever, and other essential fevers, on the theory of its oxidizing powers. In cholera and acute rheumatism its value seems less likely. As a remedy for morphine poisoning it has also been exploited—dose up to full toleration. It has been much used locally.

QUASSIN.

Standard granules—Gr. 1-67, gm. .001; gr. 1-12, gm. .005.

Quassin is a glucoside from the Quassia amara. From a kilogram of quassia wood Adrian and Moreaux obtained 1.25 to 1.50 grams of quassin. It is intensely bitter, slightly soluble in water, freely in alcohol.

In small doses quassin possesses the virtues of the simple non-astringent bitters. Taken into the mouth it increases the flow of saliva, and moderates thirst even during the summer heat. It arouses the appetite. Digestion is hastened, and this seems to be difficult of explanation, since the secretion of gastric juice is not increased or even hastened. Probably it is a secondary effect to the arousing of appetite. But if given on an empty stomach and not followed by food, quassin is followed by a sense of discomfort, and acid regurgitations.

In doses of gr. ¼ Campardon found quassin to cause severe headache, burning pain in the œsophagus and pharynx, nausea,

vertigo, restlessness, diarrhea, ardor urinæ with lessened excretion. Potter states that a concentrated solution caused serious symptoms of narcotism in a child four years old. Its solutions are very destructive to flies and insects, and to ascarides.

Under the influence of regular medicinal doses of quassin the stools become more regular, from the tonic influence of the remedy on the intestinal musculature. Possibly the intestinal secretion is also increased, if there has been deficient secretion from atony. Diarrhea continuing from atony is likewise checked by quassin. Nutrition is furthered indirectly by the improvement in the digestion, not otherwise.

Sousa Refoios found that very large doses injected into a dog caused convulsive tremblings. Haertel applied the alcoholic extract of quassia to wounds of the thigh of rabbits, and found it caused their death.

Kurtz noted temporary paralysis of the posterior extremities following lavage of an ulcer in an animal, with infusion of quassia. The administration of quassia in large doses long continued caused in a man amaurosis (Kurtz), amblyopia (Kraus), involuntary spasmodic movements in very irritable women (Barbier).

An enema of quassia given an infant caused pallor, small pulse, shallow respiration, debility and vomiting; the life being saved by energetic stimulation (Reckit).

Compardon concluded from his studies of the quassins that they activated and augmented the secretions of the salivary glands, liver, kidneys and perhaps the mammary glands; aroused the action of the gastrointestinal musculature, of the uropoietic apparatus, the bile ducts, increasing the mucous secretions and facilitating the normal excretions; during illness they increased the appetite, renewed the forces, facilitated normal excretion, rendered defecation easier, and hastened the expulsion of renal and of hepatic calculi; with healthy as well as sick men they determined in a certain dose toxic effects recalling the action of the strychnine group; quassin amorphous in doses above 2½ grains, and the crystallized in doses above gr. ¼, caused symptoms of intoxication, local or general, such as nausea, vomiting, diarrhea, vertigo, febrile agitation, cramps, and convulsions, for which it was necessary to use chloral internally and chloroform externally (by inhalation?).

Therapeutics.—Quassin has been employed largely for the purpose of stimulating digestion and the flow of bile. It is indicated, says Van Renterghem, in labored and slow digestion, stomachal and

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intestinal, in all morbid states accompanied by defective biliary secretion, in chronic intestinal catarrh due to the presence of badly digested food, and in lienteric cases. He prefers the granules of gr. 1-67 each, silver coated, to cover the bitterness; and as an eupeptic gives one or two to an infant, three or four to an adult, a little before the principal meals. Burggraeve loved to associate with quassin the arsenate of soda, in like doses, and this combination is a happy one. The salts of arsenic in the small doses increase the appetite, activate the digestive functions, and act as antiputrefactives. This is the direct action, but their role is not ended here. From the moment they enter the circulation they exercise their modifying action on the nutrition, tonifying the tissues, and preventing the impoverishment of the blood, thus indirectly contributing to the cure of the dyspepsia.

Given as a cholagog, Van Renterghem prescribes quassin in doses of a granule or two every hour, alone or with caffeine, podophyllin, euonymin, iridin, leptandrin or sodium sulphate. In lienteria the best auxiliary is surely magnesia sulphate in purgative doses, given in early morning, then according to the indications followed by naphthalin, bismuth subnitrate, cotoin, strychnine, hyoscyamine, etc.

Like all the bitters quassin has some good influence in remittent and intermittent fevers. It preserves animal matters from decay. It has been employed as a remedy for alcoholism; and to destroy the appetite for liquor.

In France quassin forms one of the ingredients of the liquid served as a beverage to school children, which contains also licorice and a trace of phosphoric acid; the object being to discourage excessive drinking in summer. This effect of relieving thirst has not received the attention it deserves on this side the Atlantic. The French dosimetrists also employ quassin to a large extent as a general toner and vital inciter where we use the more and unnecessarily powerful strychnine—and here we might with advantage follow their example, holding the strychnine in reserve for emergencies worthy of its powers, and discouraging the popular tendency to make of it a stimulant for lay self-prescribing whenever such an agent is supposed to be needed. Strychnine should be held strictly in the control and possession of the physician.

We cannot agree with our French brethren as to the best manner of administering the bitters. A quassia cup imparts its bitterness to water for years even if used every day. The quantity of quassin

dissolved at each dose is exceedingly small, or the cup would soon be exhausted. Yet the therapeutic effects are undeniable; and in fact seem to be better than when quassia is swallowed without being tasted. The effect upon the gustatory nerves, if not the principal one, is at least too important to be disregarded. Give the smaller granules of quassin, which are powerful enough for all ordinary cases, and let each dose be taken in solution just before each meal; and you will secure the maximum effect with the minimum of the remedy.

The use of quassia infusions as a remedy for seat worms should be discouraged. There are more efficient methods of treatment, devoid of the danger sometimes accruing to the use of quassia.

As a remedy for the alcohol habit the simple bitters are less effective than berberine, which more powerfully tonifies the relaxed fibers and removes the depression and nervelessness of the reformed inebriate.

QUININE.

Standard granules—Arsenate gr. 1-67, gm. .001; gr. 1-6, gm. .01; hydrobromate gr. 1-6, gm. .01; hydroferrocyanide gr. 1-67, gm. .001; hypophosphite gr. 1-6, gm. .01; picrate gr. 1-6, gm. .01; salicylate gr. 1-6, gm. .01; sulphate gr. 1-6, gm. .01; valerianate gr. 1-6, gm. .01.

Quinine is an alkaloid from the bark of various species of Cinchona. Closely allied bodies are found in Remijia, and in other plants. Cushny enumerates as constituents of the cinchonas 21 alkaloids, 6 acids and 3 neutral bitter substances. The effects of each specimen of the bark and of the galenic preparations derived from it, consists of the sum of the effects of such of these active principles as it possesses, in the quantity and relative proportions in which they happen to exist in that particular specimen. Those principles which have been studied agree as to their general effect to a remarkable degree—in fact we doubt if there is a parallel case in the known vegetable materia medica, where all the active principles of a plant have so closely similar general effects. But few of these active principles have been studied or even tested; so that in the numerous agents of unknown powers there may be as absolute antagonism as exists in the alkaloids of opium, hyoscyamus and jaborandi. The presence of three varieties of tannic acid accounts for the astringency of cinchona and the slowness of action of the crude preparations. Great efforts have been made by the Indian government to push the use of a preparation consisting of the com-

bined alkaloids from the plant, but it has scarcely been heard of outside that country, the medical profession being satisfied with the convenience, certainty, smallness of dose, quick action, palatability, and other advantages which quinine possesses over the bark from which it is derived. That the thought of obtaining similar advantages from the use of the alkaloids of other plants comes so slowly to the mind of the profession must be set down to the intense conservatism characterizing it.

Physiologic Action.—Quinine first stimulates, then kills protoplasm. Binz found that minute doses may increase the movements of amoeba and infusoria, at first; larger doses paralyze them at once, the protoplasm becoming dark and granular. On the germs of putrefaction the effect is about equal to that of carbolic acid. Alcoholic, lactic and butyric acid fermentations are retarded or prevented by quinine. Moulds, however, grow freely in its solutions. Experimenting with the sea-urchin, Hertwig found that quinine paralzyed the movements of its spermatozoa, and delayed or prevented the evolution of the ovum. Minute quantities of quinine suffice to stop the movements of the leucocytes, prevent their passing through the vessel walls, causing them to become darker, granular, and to break up into debris (Binz). No accumulation of leucocytes at an irritated point occurs under quinine, and if this has preceded the application of quinine, the process is at once arrested by it. The same result follows when quinine is carried to the part by the blood vessels. Ordinary doses of quinine lessen the number of leucocytes in the blood.

The oxidizing action of blood is diminished by quinine. So is its coagulability. The gastric and pancreatic ferments are rendered less active by quinine (Rossbach), but ptyalin and diastase are unaffected (Binz). Quinine prevents the formation of hippuric acid from benzoic acid and glycocoll. The functions of the spinal centers, respiration, circulation and vascular pressure, are all stimulated by small doses of quinine and sedated by very large ones. The arterioles are contracted, the heart accelerated, both actions being reversed later by large doses. The same preliminary stimulation and subsequent depression is noted as to the muscular fiber. The urine is slightly increased.

Given to man in medicinal doses, quinine acts on the stomach as the other bitters do, increasing the appetite. Full doses cause ringing in ears and some deafness; total and permanent deafness has followed a single dose of 40 grains but this is exceptional. The

field of vision may be contracted, and partial or total blindness may ensue, for days or weeks.

Color vision is often affected. The aural disturbance is attributed to congestion of the auditory apparatus, that of sight to contraction of the retinal vessels, which may be followed by some optic nerve atrophy. Large doses cause a sense of fullness in the head, slow pulse and staggering. In the few cases in which overdoses have proved fatal, there were symptoms of heart weakness and collapse, loss of sight and hearing, muscular weakness, apathy, slow gasping respiration, and coma with failure of respiration. Delirium and convulsions have been reported. The toxic dose is uncertain, since an ounce has been taken without dangerous symptoms. Idiosyncrasies are not rare. The aural and ocular symptoms described occasionally follow the use of small doses; many varieties of eruptions have been attributed to quinine; and a fever resembling malaria. Sometimes it contracts the uterus and may cause abortion, though as a rule no such effect follows the use of even full doses. It often irritates the stomach, even in moderate doses—as all the bitters are liable to do—and may cause diarrhea, albuminuria or hematuria. The writer had one patient in whom the taking of four grains of quinine repeatedly caused purpura hemorrhagica.

Even in doses too small to cause any tangible symptoms, quinine affects metabolism. The destruction of nitrogenous tissues is markedly lessened; the production of urea and uric acid being especially restricted; the excretion of phosphates and sulphates is also reduced, but the excretion of carbonic acid and absorption of oxygen through the lungs is not materially altered. Cushny concludes from this that the work done and the heat formed are not affected but that the death, growth and repair of the tissues are less active. Nitrogen is stored in the body.

In malarial and other fevers quinine lowers the temperature by direct action on the tissues (Binz). It has little effect on a normal temperature. Gottlieb found both the production and the radiation of heat reduced by quinine. The reduction of temperature is much greater if given when the fever is falling, than when rising.

Quinine appears in the urine within 30 minutes from its administration by the mouth, and one-half the whole dose is excreted within six hours (Cushny). Traces are still to be found 72 hours after it has been taken.

Solutions of a grain to the ounce destroy microörganisms, and double this strength prevents fermentation and putrefaction. Large

doses destroy the sense of hunger and arrest the secretion of gastric juice. It has been detected in the sweat, tears, and milk of nurses; in bile and the fluid of dropsical effusions. Inflammatory degeneration of tissue is notably decreased. It probably destroys infectious microörganisms in the blood and tissues (Shoemaker). It is also found in the feces.

The sulphate of quinine is soluble in 800 parts of water, the hydrochlorate in 35, the hydrobromate in 54, and the valerianate in 100. The bisulphate is soluble in 10 parts of water. The addition of sulphuric, hydrochloric, hydrobromic, or any acid, renders the sulphate more soluble, but increases the bitterness of the solution. Quinine is absorbed from the rectum, the vagina, or the subcutaneous tissue, though the latter is a very painful method of administration and apt to be followed by abscess.

Piorry, Paget, Magendie, Landois and Mosler affirm that quinine reduces the size of the spleen even in health, as it undoubtedly does in malarial affections, but Cushny finds the evidence inconclusive.

By many quinine is credited with the power of checking the exudation of fibrin, and for this reason it is administered in full doses to prevent the exudations of croup and pneumonia.

Synergists.—As an antizymotic, quinine is aided by arsenic, salicylic acid, resorcin, the sulphocarbolates; as an antipyretic it is associated with aconitine, veratrine, digitalin and the coal tar group; the strychnine group increases its tonic and febrifuge effects, while as a means of delaying or preventing nitrogenous waste it is aided by caffeine and alcohol.

Incompatibles.—Tannic acid, iodine and its salts, alkalies and their carbonates, the alkaline earths, all precipitate quinine from solution.

Therapeutics.—The first use of quinine is as a remedy in malarial fevers. Here its great value has led to abuse and incredible carelessness in its administration, so that a series of reactions against it occur.

In all cases when time is allowed it is best to thoroughly empty the alimentary canal by efficient cathartics, and disinfect with a sufficiency of the sulphocarbolates. Then give quinine in full doses, during the decline of the fever. In intermittents from 10 to 15 grains a day suffice for an adult; in remittents these doses should be doubled; while in the pernicious forms of malaria met in the tropics forty to sixty grains should be given without delay. It is best to use the soluble salts, as much of the large doses of the sul-

phate is ejected unabsorbed. In the algid forms, or pernicious chills, the dose should be injected hypodermically or by the rectum, in solution. Inunctions of quinine are too uncertain for dependence. The bimuriate of quinine and urea is quite soluble, but the hydrochlorate answers about as well.

It has been claimed that the arsenate of quinine fully represents the virtues of this agent, and that a grain equals in therapeutic effect fifteen grains of the sulphate. This is still undecided, but there is reason to believe that it is true. At least the efficacy of the arsenate in the chronic forms of malarial toxemia appears to be much greater than that of the sulphate, in any dose. It is hardly possible to overestimate the importance of the preliminary cleansing and disinfection of the gastrointestinal tract.

Many prefer to administer the antipyretic dose of quinine in a single dose, aiming to so give it that the ringing of the ears may occur at or just before the expected recurrence of the chill—that is, about six hours before the latter is due. But the writer believes any advantage derived is suggestive, and malaria has always been known to be amenable to suggestion. Better results may be obtained with much smaller doses by giving the quinine in very small doses very frequently repeated, so that there is never a moment when the remedy is absent from the blood and the alimentary canal.

No matter how large a dose of quinine may be given, it will not prevent the multiplication and continued action of the parasites after the effects of the dose have subsided; but if there is a continual infiltration of the drug into the blood there is never a moment but that the newborn plasmodia are met and killed by it; until the invaders have become extinct. This at least illustrates the method of treating the disease that has proved most successful, whether the explanation is literally correct or not.

Van Renterghem advises the administration of a massive dose to break up the attack; meeting the fever with the defervescents, following with the selected quinine salt, one to five granules every half-hour, or hourly, adding a granule or two of strychnine for adults or one to five of brucine for children. This is continued until the next period for a chill has passed. If a new access occurs strychnine is given alone, a granule or two every half-hour during the cold stage, then the Defervescent Triad during the fever. But the second chill is unlikely to happen, the third still more so. On the free days one should take the arsenates of quinine and arsenic, one to three granules each, every two or three hours. This dosage is

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not absolute—the physician must regulate them by the need and the effect. Dosimetry gives a choice of the quinine salts.

In malarial dropsy and enlarged spleen he employs quinine and such other agents as may be indicated—iron for anemia, quassin for anorexia and dyspepsia, strychnine for general systemic atony, digitalin for dropsy, quinine and arsenic for the paludal cachexia. Of the arsenates of strychnine, iron, quinine and soda, give five to ten granules each in a day; quassin two to four granules before each meal; digitalin a granule or two hourly or half-hourly till the urine is secreted abundantly.

In neuralgias and paroxysmal neuroses quinine will often prevent the attacks. He prefers the hydroferrocyanate, valerianate and arsenate here; given half-hourly or hourly in the intervals, often adding strychnine arsenate. During the attack give aconitine, caffeine, morphine, hyoscyamine, strychnine, gelseminine, butyl-chloral, zinc cyanide, alone or combined.

For non-paroxysmal neuroses, quinine has not the decided beneficial action shown in the preceding forms.

As an antipyretic quinine has been largely employed in many fevers, typhoid, eruptive, pneumonia, pyemia, hectic and puerperal; alone in massive doses or with cold baths. Juergensen gave doses of 60 to 75 grains in pneumonia, and Pepper gave suppositories of ten to twenty grains in the pneumonia of infants. In the fever of tubercular phthisis the old favorite termed Niemeyer's pill may be represented alkalometrically by a grain of quinine hydrochlorate, digitalin gr. 1-67, emetine gr. 1-67, and codeine gr. 1-12; and this may be given every four hours. But the cleansing and disinfection of the alimentary canal has proved more effective, with the Defervescent Triad or the Trinity of Burggraeve, so that the need for quinine is rarely met.

In acute inflammations of all sorts Van Renterghem considers quinine indicated as an antiphlogistic. He advises small doses repeated so often that the solution of quinine constantly bathes the affected tissues. He has also employed this agent with success in treating hemorrhages, bronchial, pulmonary, intestinal, uterine; giving fractional doses with arsenic, strychnine, ergotin, and of late with hydrastine.

As a general tonic quinine has been altogether replaced by strychnine.

Quinine is one of our most reliable remedies in whooping-cough, when given in doses of three or four grains to a child two

years old. It is best given here as the sulphate, suspended in syrup of yerba santa, which covers the taste admirably. There is possibly some local action on the throat when thus given. The addition of acid to render the quinine soluble ruins this mixture by precipitating the yerba santa as a tarry mass.

In true spasmodic asthma a full dose of quinine, gr. 15, given at bedtime, will quite surely prevent the paroxysm for the following night.

As quinine lessens the production of uric acid, part of the credit it once possessed may have been due to its administration in uric-acidemia. But agents promoting the elimination of this toxin are to be preferred.

Quinine has been advised in the choleras, presumably as an antiseptic; but there are many better and less irritant agents for such uses.

Shoemaker says quinine favorably influences the broncho-pneumonia of measles, and combats the tendency to caseous degeneration; reduces the discharges of suppuration, prevents sapremia and pyemia; is of use for phthisical night-sweats, neurasthenia, general debility; Meniere's disease (Charcot); and malarial skin diseases (Yandell).

Haig states that ordinary sulphate of quinine contains 20 per cent of xanthin, equivalent to uric acid, and this may aid in destroying red blood cells and liberating hemoglobin, producing hematuria in malaria.

Quinine was for many years employed so generally that it was almost a matter of course to have this in the prescription; and many tons of it were thus wasted. Its place in this respect seems to have been taken by strychnine.

The contraindications for quinine are: Idiosyncrasy, acute inflammation of the genitourinary tract, kidneys, stomach, bowels, or middle ear with impaired hearing, infantile eczema, epilepsy.

The effect of quinine upon the ears is largely prevented or relieved by giving full doses of any bromide, or of hydrobromic acid. The use of small and oft-repeated doses allows the physician to administer this drug till the first evidences of action are manifest and then stop it or give less frequently; by which all such unpleasant effects are prevented.

Some authors credit quinine with oxytocic powers, and advise it in place of ergot in atonic states of the uterus. This would render pregnancy a contraindication to its use. But others deny this, and

look upon such an action as rare, and an idiosyncrasy. In dealing with pregnant women it is well to keep on the side of safety.

RESORCIN.

Standard granule—Gr. 1-6, gm. .01.

Resorcin is a synthetic product, one of the few that seems worthy of a place in modern therapeutics. It is soluble in water, alcohol or glycerin. Injected subcutaneously it causes little inflammation and no suppuration. In doses of gr. 30 to a dram it acts as an antipyretic, reducing the temperature for some hours, but causing nausea and symptoms of marked depression. Larger doses are dangerous, and death has been caused in children by washing out the stomach with a 3 per cent solution. It is excreted with the urine, and has caused hemoglobinuria.

The symptoms of overdoses call for stimulants, hot drinks, atropine and strychnine hypodermically.

Resorcin is antipyretic in the doses named, but has been superseded by safer and not less efficient remedies of this class. It is antiseptic, but the sulphocarbolates replace it as well and more safely. It is antirheumatic, and in cases with evident gastric fermentation and high fever resorcin may be well suited, especially when the salicylates are not well borne. Here it is best to give the small dose, gr. 1-6, every quarter or half-hour, till improvement is decided. Resorcin is also astringent, and possibly in the declining stages of cholera infantum and other gastrointestinal maladies it may be appropriate; though the sulphocarbolate of zinc leaves little to be desired in this respect. In fermentative dyspepsia resorcin is useful, given as recommended for rheumatism.

Locally resorcin has been extensively employed as an antiseptic and astringent, and with benefit. The applications are too numerous and too obvious to require enumeration.

RHEIN.

Standard granule—Gr. 1-6, gm. .01.

Rhein is a concentration from rhubarb, the root of Rheum officinale.

Rhubarb contains a glucoside chrysophan, besides emodin, chrysophanic acid, phaeoretin, erythrorhetin, aporhetin, rheotannic and rheumic acids, and certain resins. Dragendorff attributed the

purgative principle to the cathartic acid, while the astringent tonic action is due to the tannic acids, the antiseptic effect to chrysophanic acid and emodin. Hesse also obtained a crystallizable principle, rhein, but Tschirch attributes the purgative power to emodin, or chrysophan. However, the true values of rhubarb cannot be said to depend on any one of its constituents, as at present known, but upon their combination; and although forming an exception to the alkaloidal principle, we must content ourselves with the concentration until chemistry has advanced our knowledge. Yet it is one of the remedies that fills a valuable need, and cannot be replaced by any one of the modern remedies, though they have materially narrowed its field.

Therapeutics.—Rhubarb increases the saliva, gastric and intestinal juices and stimulates peristalsis; later its astringent principles exert their influence. This renders rhubarb especially suitable to the treatment of diarrheas where it is necessary to clear the gastro-intestinal tract of offending matter and check the discharges later. In children especially this indication frequently presents itself. Rhubarb increases the secretion of bile, though not a powerful cholagog. In fact, it has the repute of stimulating the healthy, normal secretions instead of pathologic ones. The coloring matters are excreted through the kidneys and the renal excretion is increased. The purgative resins are excreted by the liver, intestinal glands, kidneys and skin. The nurse's milk contains enough to purge her nursling.

Rhubarb is used largely for the gastric and intestinal troubles of children due to improper diet, to cold, over-eating, and emotion. When the child is cross and fretful this remedy usually restores peace and happiness to the household.

It is also an effective remedy for colics dependent on undigested food or other irritating matter in the stomach or bowels. Travelers' diarrheas from change of water, of adults or children; sea and car sickness, acidity with irritating discharges, and hemorrhoids, especially during or after pregnancy, are benefited by rhubarb. For gastric catarrh the best way to use it is to take one of the granules as a lozenge, dissolved in the mouth, every one to three hours.

In the early and mild forms of summer diarrhea and cholera infantum, rhubarb is most effective. Here it may be given with emetine, hydrastine and menthol, a granule of each every two hours till the stools passed are natural in appearance. Zinc or soda sulphocarbolate should be added if the stools are offensive. In

cachectic, rickety children the sulphocarbolate of calcium with the above combination is excellent.

Felter and Lloyd give as the specific indications for rhubarb: Gastric irritation, nausea, vomiting, elongated tongue red at tip and edges; irritative diarrhea with soreness on pressure; sour smelling discharges imparting a sour odor to the child; gastrointestinal irritation with nervous irritability, restlessness, screaming and convulsive muscular contractions; constipation with a sense of intestinal constriction and abdominal contraction; light-colored fecal discharges.

Rhubarb seems unknown to the French Dosimetrists, who have utilized juglandin largely as a substitute—and the writer has found the latter so satisfactory that he does not use rhubarb one-tenth as much as he did before he learned to use juglandin.

The dose of rhein for a child of two years is a granule every two hours till the stools are normal. For adults two to five granules may be given at the same intervals.

RHUS TOX.

Standard granule—M. 1-10.

The granules of rhus tox. are prepared from the green leaf tincture.

The effects of rhus are due to a neutral body, toxicodendrol, closely resembling cantharidin, anemonin and euphorbol (Pfaff). It is not volatile and the belief in poisoning from this plant without actual contact is said by Cushny to be without foundation. Toxicodendrol is a fixed oil, soluble in alcohol but not in water, rendered insoluble by lead. Maisch claimed that the true active principle was toxicodendric acid, a volatile principle, and that the exhalations of vigorous leaves redden blue litmus, if previously dampened.

Felter and Lloyd say that rhus is a powerful local irritant, affecting persons with varying degrees of virulence, and that many persons are poisoned without actual contact, especially if the air is heavy and humid or the patient perspiring. Alcoholic solutions retain the virulence for years (Johnson). A lady in Lloyd's employ is not allowed in the building when rhus is being bottled, so intense are the symptoms produced by the emanations. The symptoms tend to recur monthly or yearly in some persons once poisoned by this plant. Horses, cows and sheep are unaffected by eating the leaves, but dogs and guinea pigs are killed by it. Drying or heating dissipates the toxic properties, at least in part.

The local effects consist of a dermatitis with itching and swelling, redness and sometimes vesicles, burning pain and fever. Sometimes pus forms. Headache and even delirium may be present in severe cases. The symptoms appear some hours after contact and the affection runs its course within a week. The skin desquamates.

Given internally, rhus acts on the kidneys and skin, slightly on the bowels. For paralyses it should be cautiously pushed until it causes prickling and burning, with twitching of the paralyzed parts, when improvement of sensation and motion will be manifest. Large doses cause vertigo, dilation of the pupils, impairment of the special senses, chilliness, nausea, thirst, burning in the stomach, temporal constriction, pulse slow, irregular and weak, urine and perspiration increase, weakness, trembling and faintness occur, sometimes convulsions, and a state of stupor or coma may supervene.

Felter and Lloyd vaunt rhus highly, saying its range of application is exceeded by few drugs. It is an ideal sedative, controlling the circulation and acting strongly on the nervous system. The specific indications are: The small, moderately quick, vibratile pulse, with sharp stroke, and burning sensations; nervous erethism; the sick infant sleeps disturbedly, frequently starting suddenly, with *cri encephalique,* often seen in cholera infantum and cerebrospinal meningitis. The circulatory disturbance requiring rhus is localized, in small cerebral or nerve centers. Restlessness is great in proportion. Frontal and left orbital pain, sharp; tongue red at tip and edges or strawberry with tympanites, brown sordes, red mucosa, acrid discharges, ichorous flow, disappearing by drainage. It relieves vomiting when with the tongue described. Great unrest with vomiting is a chief indication for rhus. Burning pain, deep or superficial is relieved by rhus quicker than by any other agent; whether of the head, abdominal, thoracic or urinary organs, eyes or skin. It may be neuralgic, rheumatic, pleuritic, cystitic, etc. Burning and erysipelatous redness of the skin rhus cures. It relieves rheumatic pain made worse by the warmth of the bed. It is better in acute than in chronic rheumatism, and in the articular stiffness following attacks. It controls the restlessness of rheumatics. Toothache aggravated by heat it relieves. It is of value in bowel troubles of infants, diarrhea, typhoid dysentery, typhoid and malarial fevers with typhoid symptoms, and in cholera morbus. It is valuable in pneumonia, bronchitis, influenza and phthisis, when the patient is extremely irritable and the stomach irritated. With the small wiry pulse as a guide it controls restlessness and delirium in adynamic

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fevers; is indicated in typhoid pneumonias with red glazed tongue and fetid sputa; relieves dry tickling cough; and skin diseases with redness, swelling and burning. It is excellent for vivid bright red erysipelas, facial, with puffiness; acute dermatites; herpes with burning, itching and exudation; with iron in purpura hemorrhagica; vulvar erythema and erysipelas, with burning, and itching irritation following micturition; a special antizymotic in the exanthemata and all zymotic diseases; with vital depression, livid skin and foul discharges; red glistening swellings or edges of ulcers; parotitis, submaxillary swellings; carbuncle, furuncle; ocular swellings, to prevent inflammation after cataract operations, papebral œdema with redness, pains in the eye globe, conjunctivitis acute or chronic, catarrhal ophthalmia of scrofulous children with inflamed lids, photophobia, etc.; paraplegia without any organic lesion; paralysis of the bladder and rectum. But it is of little value in any paralyses save those following rheumatism. In sciatica it is efficient.

Specific Indications.—Small, moderately quick, sharp pulse, sometimes vibratile or wiry; great restlessness; with vomiting; tongue red and irritable, red spots, strawberry tip; burning pain; pain in or above left orbit; pinched face; burning urethral pain with dribbling, etc.

Ellingwood recommends rhus in acute rheumatism, with aconite for fever, cimicifuga for deep-seated muscular soreness; in dry tickling bronchial coughs, with bryonia or aconite in capillary bronchitis; gastric or intestinal disorders of children with great restlessness and flushed face; and the specific tongue, mouth and mucous indications; prevents spasms from cerebral engorgement or reflex, or from gastric or intestinal irritation. He finds it most prompt and valuable in pruritus vulvæ with erythema, redness, especially in blonde children with eczematous or scrofulous tendencies.

Dr. R. E. Buchanan reports excellent results from rhus in lumbago, acute muscular soreness, torticollis, and similar myalgic troubles.

Dr. John Aulde is one of the few who have studied this remedy. He finds the first effects of remedial doses to be stimulant to the cerebral functions, differing with the great disparity in its effects in various individuals. The effects upon the skin are due to the endeavor of the epidermic cells to drive out the intruder. This renders this agent suitable in affections showing sluggish skin-action, or inactivity of the cellular structures. He recommends rhus in scaly skin

diseases, subacute and chronic rheumatism, and as a quick means of relieving the pain of rheumatic gout.

Dr. A. T. Cuzner testifies to the efficiency of rhus in rheumatism.

Dr. C. W. Smiley writes that while suffering from nervous debility and general prostration, insomnia and great irritability, he was attacked by rhus poisoning after free exposure to the weed. Soon after he found his health had undergone a remarkable change for the better, and he was soon boasting of complete recovery. He attributes the result to the free elimination of toxins, caused by the rhus.

Dr. J. M. Blackerby found rhus successful in sciatica; facial erysipelas; synovitis of both knees, subinflammatory, tongue red and pointed, bowels acting naturally, urine scanty, red and offensive, pulse 108, temp. 101.5, heart feeble—patient a man aged 22.

In *The Alkaloidal Clinic* some years ago the subject of rhus poisoning was discussed at length, and many physicians suggested remedies for it. Of these the local application of sweet spirit of niter seemed to have the most decided and prompt effect in relieving the symptoms and curing the malady. Webster reports one patient treated by echinacea locally and internally, who was not only cured but henceforth proved immune against the poison. Among other remedies named were alnus, apocynin, hydrogen peroxide, pilocarpine hypodermic, sodium bicarbonate locally, aristol, lobelia locally, lead and laudanum, white oak bark infusion, quinine ointment one to 8, sodium bisulphite 5 per cent solution with one per cent of carbolic acid, dilute alcohol saturated with lead acetate and well rubbed into the skin, zinc sulphate one to 15 of water, hamamelis, serpentaria, sodium hyposulphite saturated solution, and numerous others.

Some persons appear to be immune against the effects of rhus, and they are said to be also immune against its remedial operation. The more susceptible the patient, the more certain is rhus to cure his maladies when correctly prescribed.

In administering rhus it is best to give the granules containing but a fraction of a drop, and repeat them every half-hour until tangible effects are manifest. This avoids the painful rhus toxication in persons unusually liable to it, and ensures action in those difficult to affect by it.

RUMICIN.

Standard granule—Gr. 1-6, gm. .01.

Rumicin is a concentration from Rumex crispus, the yellow dock. Rumex contains chrysophanic and oxalic acids.

Felter and Lloyd pronounce rumex decidedly alterative, tonic, mildly astringent and detergent. They recommend it in scorbutic, cutaneous, scrofulous, scirrhous and syphilitic affections, leprosy and elephantiasis; finding the plant inducing retrograde metamorphosis, increasing innervation and improving nutrition; in bad blood with skin disorders, chronic lymphatic enlargements, with tendency to indolent ulcerations and low inflammatory deposits; small doses in nervous dyspepsia with epigastric fullness and pain, aching or darting pain in the left chest, gastric flatulence and eructations; for painless watery diarrhea; cough with fullness of chest, sighing, yawning, efforts for full inspiration; best in lung ails with bad blood; respiratory catarrhs and sore throat with hypersecretion, and even in incipient phthisis; dry stubborn summer coughs (Webster); internally for contagious prurigo.

Specific Indications.—Bad blood with chronic skin diseases; bubonic swellings; low deposits in glands and cellular tissues, tendency to indolent ulceration; feeble recuperative power; irritative, dry laryngotracheal cough; stubborn, dry summer cough; chronic sore throat with enlarged glands and hypersecretion; nervous dyspepsia with epigastric fullness and left thorax pain; cough with dyspnea and precordial fullness.

Ellingwood values rumex as a renal depurant and agent to remove morbific matters from the body; for ulcerative stomatitis, nursing sore mouth, gastric ulcer with atony, it has no equal. It has cured obstinate morning diarrheas.

Rumicin seems to be best administered in doses of one to six granules for an adult, before meals and at bedtime. Give for several weeks or longer—it is not a remedy for immediate effect. It would be a good adjuvant to arsenic iodide.

SALICIN. SALICYLIC ACID.

Standard granule—Gr. 1-6, gm. .01.

Salicin is a glucoside from Salix nigra, found in many species of willow and poplar. It is decomposed and oxidized into salicylic acid in the alimentary canal, and exerts the effects of this acid in the body.

It is excreted through the urine. Salicin is less irritant to the stomach than the acid.

Salicylic acid and its congeners are as antiseptic as carbolic acid but far less toxic. The salicylates are also much less irritant than the acid. It retards digestion, affecting every one of the ferments injuriously. It also retards the putrefaction of proteids and the alcoholic and acetous ferments. Its effects in this respect are less powerful than those of carbolic acid but last longer. The motion of protoplasm, protozoa and leucocytes is prevented by the acid.

Salicylic acid and its salts are quickly absorbed, and give rise to unpleasant symptoms only when given in large doses. They cause a sense of heaviness and fullness in the head, roaring in the ears like that of quinine, followed by confusion and dullness, with disorder of sight. Free sweating and a sense of heat may occur. Dyspnea has been noted, with evidences of collapse. The pulse is weak, the temperature subnormal, and partial or complete unconsciousness may follow. In some cases delirium, hallucinations of sight and hearing, have been noted, especially in alcoholics and diabetics. Albuminuria and hemoglobinuria have also occurred. Skin eruptions are more common from its long continued use than from too large doses. Abortion occurs sufficiently often to render pregnancy a contraindication. Hemorrhages may appear, especially from the nose.

But to all the foregoing there is to be added the following: Hare collected a large number of cases of poisoning by these agents, showing that in some so small a dose as 15 grains caused toxic symptoms, while in others two ounces were swallowed without causing death. It seems quite certain that the commercial synthetic acid and its salts are contaminated by impurities to which most of the toxic symptoms are really due; while the chemically pure acid and its salts do not irritate the stomach or depress the heart in any doses likely to be given medicinally.

The affections of hearing are due to congestion, even extending to inflammation; they rarely leave permanent diminution of hearing; the dimness or loss of sight is due to vascular constriction possibly; the cutaneous vessels are dilated, the pressure increased by small doses, lowered by large ones; small doses accelerate the heart, large ones slow it, from direct action on the heart; the respiration is faster from central action, the center being depressed and paralyzed later, from which death ensues.

The effect on the central nervous system is slight. Sweating is due to dilation of the cutaneous vessels, which may explain the

rashes. The urine is increased, as is the production of urea, the bile solids but not the fluid. The normal temperature is only lowered by toxic doses. Fever heat it often lowers. The fall is due to dilation of the skin vessels and to an increased radiation; it is less and of shorter duration than the fall caused by antipyrin.

Salicylic acid modifies metabolism, increasing the nitrogen and sulphur eliminated by the kidneys by over 10 per cent. The excretion of uric acid is increased from 30 to 100 per cent. The leucocytes increase in number. Mainly excreted in the urine, salicylic acid is found in the milk, perspiration and bile, but not in the gastric juice.

The use of this acid as a preservative of foods and beverages is now forbidden by the laws of many countries. The effects upon the digestive ferments justify such legislation; and besides the use of such preservatives enables the unscrupulous packer to utilize products in which decomposition has already progressed beyond the point of wholesomeness.

Van den Corput states that salicylic acid lessens the functional activity of the testes, and Salix nigra has long had the reputation of suspending the sexual powers. Yet the same agent is believed to congest the uterus and ovaries.

Therapeutics.—Salicylic acid and its salts and derivatives have all been used with benefit in rheumatism. The greater the pain and higher the fever, the more prompt and powerful is the beneficial action of this remedy. Hence it is better in young subjects than in the middle aged or elderly. It is best given to rheumatics in doses of a grain or more, repeated every half-hour till the ears begin to ring. This gives better results than bulky doses that may irritate the stomach. As a preventive of cardiac affections it does not equal the alkaline treatment. The salicylates of iron and quinine may be employed in suitable cases.

Acute forms of myalgia, such as lumbago, torticollis, pleurodynia, and the numerous forms of abdominal and dorsal myalgia, are quite satisfactorily relieved by this agent. Gout and rheumatoid arthritis are also relieved by an agent that stops fermentation in the alimentary tract; but the writer has never obtained the slightest benefit from it or any form of salicin in gonorrheal rheumatism.

Chronic forms of the above affections are only benefited by salicyl as it checks acid fermentation. Many maladies may be traced to this source, neuralgias, neuroses, skin diseases, iritis, and tonsillitis. Gay gave the acid successfully for Meniere's disease, in

doses of gr. 10 daily. Strizower recommended it for gall-stones, gr. 10 four times a day; Shoemaker for worms, gr. 8 hourly for five doses; for the foul breath of phthisis; Monin for diabetes.

As an antiseptic antipyretic this acid has been given in typhoid fever, pneumonia, erysipelas and phthisis, but especially in blood-poisoning, pyemia, sapremia, etc. De Rosa claimed it was prophylactic against scarlet fever. Dr. C. A. Bryce, of Richmond, Va., finds that in smallpox it reduces fever, relieves pain and limits the development of the pustules.

Salicylic acid quickly checks the development of sarcinæ ventriculi.

As an analgesic salicylic acid in doses of gr. x has relieved the pangs of cancer. Bernheim injected it into inoperable forms of cancer of the cervix uteri in five cases, with decided benefit. His solution was made with 90 grains of the acid in an ounce of distilled water, adding 3 drams of glycerin and 4 drams of alcohol; of this he injected 30 minims into the substance of the tumor for five successive evenings.

Shoemaker recommends salicin as a useful bitter tonic in feeble digestion; and for the diarrhea of phthisis, and chronic diarrhea of children. Maclagan preferred it to the acid in rheumatism, as less depressing; also in neuralgias and coryzas. Turner used it in 200 cases of influenza with great benefit. Cheron advised it in pelvic pains of rheumatic origin, in metritis, cellulitis and peritonitis.

Cushny says that salicylic acid promotes the absorption of serous effusions, pleural and subretinal, in some unknown way.

Van Renterghem advises the salicylate of ammonia in fetid dyspepsia, pulmonary gangrene, typhoid fever, dysentery, and in flatulence; this salt decomposing in the digestive tube acts by both acid and base. Fuerbringer showed that the acid was powerless in septicemia and pyemia. Bartels showed that persons saturated with the acid did not escape typhoid or erysipelatous infection.

Van Renterghem recommends salicylate of lithia for ammoniacal urine.

Salicin was once recommended for ague but proved less effective than quinine. Many persons cannot take the ordinary salicyl preparations but find among the numerous modifications on the market others which fully affords the benefits without the disadvantages.

The dose of salicin as a tonic is a grain before each meal. It is soluble in water and in alcohol.

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In gastric fermentation quinine salicylate, gr. 1-6 every half to one hour, is quite effective.

SANGUINARINE.

Standard granule—Gr. 1-67, gm. .001.

Sanguinarine is an alkaloid from bloodroot, Sanguinaria Canadensis. It has also been found in Chelidonium majus, and in Eschscholtzia Californica. Sanguinaria also contains chelerythrine, protopine and gamma-homochelidonine. The only form in which sanguinarine is used in medicine is the nitrate.

Small doses of sanguinarine increase the appetite and the digestion, strengthen the heart and slow the pulse, and excite the respiratory secretion. Larger doses cause a sense of warmth in the stomach, nausea, sedate the heart and slow the pulse, increase the perspiration, expectoration, urine and bile, and the menses. Still larger doses cause violent vomiting, even catharsis, vertigo, troubled vision and great prostration. The saliva is increased. Violent gastrointestinal irritation ensues, with burning pain, relaxation, and the symptoms of collapse, cold clammy skin, dilated pupils, great thirst and anxiety, the spinal reflexes depressed, and death from paralysis of the respiratory and cardiac centers.

Sanguinarine is employed by the eclectics as an emetic, in conjunction with lobelia, in various febrile complaints when it is desired to thoroughly cleanse the stomach and arouse to activity the liver and glands in general. Acting gently on the liver it is used in chronic hepatitis; in small doses for atonic dyspepsia, gastric and duodenal catarrh and jaundice; sick headaches with torpid liver; for rheumatism, dysentery and scrofula with bad circulation; for anemic amenorrhea and the dysmenorrhea of debility, with chilliness and headache; hysteria; hemoptysis vicarious in character; genital debility of men; syphilides, tinea, hypertrophic rhinitis (Felter and Lloyd).

The most important field for sanguinarine is in pulmonary affections. It is a stimulant expectorant, and especially indicated in the very aged or very young, when the sensibility of the respiratory mucosa is low and the patient does not feel the need of coughing to rid the tract of accumulating secretions. In this particular condition sanguinarine has no equal. It arouses the sensibility and makes the patient cough harder until the secretion is ejected and the danger past. Great care must be taken not to exceed the stimulant dose and

get the sedation and nausea of overdoses. The indication for this remedy may arise in pneumonia, bronchitis, phthisis, and especially in capillary bronchitis.

Another indication for sanguinarine is found in acute respiratory catarrhs. The existence of disease in these tissues predicates a condition of low vitality there—else the tissues would have been able to resist the attack of disease-producing agencies and throw off the malady. Hence the indication for a special inciter of the vitality of these tissues, such as we find in sanguinarine. How far this principle of therapeutics can be carried is uncertain. In acute pharyngitis the application of a strong mixture of hydrochloric acid, potassium chlorate and tincture of iron, in which free chlorine is present, has frequently aborted the attack when applied early. The action may have been antiseptic, stimulant, vital incitant, or simply astringent—and we incline to the latter view. If sanguinarine exerts the action suggested, it does so when given in doses strictly physiologic, that is, just short of those arousing notable symptoms.

Felter and Lloyd further recommend this agent in acute and chronic nasal catarrh, humid asthma, whooping-cough, membranous croup, and scarlatinal sore throat.

Specific Indications.—Tickling or irritation of the throat, with cough, burning or irritation in fauces, larynx, pharynx or nose, with red surface and thin, acrid, burning or smarting discharge, dryness of nasopharynx or throat and sharp lancinating pain, and a feeling as if the walls of the throat rubbed against each other; poststernal constriction, uneasiness at suprasternal notch with difficulty in breathing; uneasiness and burning in stomach with nervousness.

The dose of sanguinarine nitrate as a stimulant expectorant is gr. 1-67 to 1-22 every hour till effect, relief or slight nausea. For anemic amenorrhea give gr. 1-22 to 1-12 before meals and at bedtime, during the intermenstrual period, with iron arsenate; adding apiol during the menstrual week.

SANTONIN.

Standard granule—Gr. 1-6, gm. .01.

Santonin is a glucoside from German wormseed, Artemisia maritima.

It is very insoluble in water but rendered soluble by alkalies with which it unites to form santoninates. It is slightly soluble in the stomach but most of it passes into the small intestine where it exerts

its influence. Some of it is absorbed into the circulation, causing a peculiar disorder of vision, things appearing to the patient of a yellowish green. The urine assumes the same color. If very large doses are taken the darker colors become invisible, blue seems green, and visual hallucinations may occur. The senses of taste, smell, and rarely hearing, may be deranged. Very large doses cause twitching of the head muscles, rolling of the eyes, grinding teeth, followed by epileptiform convulsions; with contractions of the muscles during the intervals. Death during the convulsions is due to asphyxia. Confusion, nausea and vomiting may occur from ordinary doses, or aphasia. The convulsions are attributed to stimulation of the cerebral cortex, the interval contractions to increased activity of the parts lying between the cerebral peduncles and the medulla (Cushny). Large doses also affect the cord. Santonin lowers the temperature in most animals (Harnack). It is partly oxidized in the tissues and is excreted in the urine and feces in several forms. Two days are required for the elimination of an ordinary dose. The quantity of urine and frequency of micturition are increased. Urticaria has appeared after its prolonged administration; and even from one three-grain dose.

Therapeutics.—Santonin is the standard remedy for round worms. Solutions do not kill these worms outside of the body, and its remedial action is obscure. Von Schroeder suggests that it renders the intestine an unpleasant abiding place for them—which is very little explanation. Precise observations made in a London hospital showed that santonin did not entirely remove the parasites, since their eggs continued to appear in the stools after full treatment with it. Against thread and tape worms santonin is useless.

The dose of santonin for a child three years old is a grain three times a day. It is usual to combine small doses of calomel—gr. ¼—with it. Lewin advises giving santonin in castor oil to hinder absorption from the stomach. Empty the bowels first by suitable laxatives, then give the day's dose of santonin, and follow in four hours with a smart laxative. Otherwise the worms may be digested and the efficacy of the treatment be uncertain.

In poisoning by santonin, empty the stomach and bowels promptly, control the convulsions by chloroform or chloral, and sustain the powers as failure threatens.

The notable effect of santonin on the nerve centers has led to its employment in other maladies. Lydston gives it for epilepsy, instead of the bromides. It is a good antispasmodic for children,

says Shoemaker; but we are well supplied with approved agents in this respect. Lydston begins with doses of gr. 2—5, for adults, and pushes it to tolerance. Saturation is denoted by the yellow urine, xanthopsia and vesical irritability.

Negro found santonin relieve the painful crises of ataxia; giving it up to gr. 22 daily.

Santonin has been given for color blindness, with some benefit in noncongenital cases. In other ocular maladies it has not succeeded. Nocturnal enuresis sometimes yields to it (Shoemaker). In anemic amenorrhea Whitehead gave santonin gr. 10 at bedtime repeated once, with benefit; and Masterman found this relieve uterine colic dependent on suppression of the menses.

SCILLITIN.

Standard granule—Gr. 1-67, gm. .001.

Scillitin is a glucoside from squill, Scilla maritima.

From squill Merck obtained three principles, scillipicrin, scillitoxin and scillin. Von Jarmerstedt and Kurtz obtained scillain, an amorphous bitter principle, soluble in water or in alcohol.

Vogel describes scillitin as a solid. diaphanous mass, colorless, of resinous fracture, pulverizable, at first bitter, then sweetish, very hygroscopic, easily soluble in water, rectified spirit or acetic acid.

Tilloy separated from this body a purer scillitin and a noncrystallizable sugar. This body does not dissolve readily in water but freely in alcohol. Landerer and Marais believed they had discovered an alkaloid, scillitine, which is probably Merck's scillitoxin. Jarmerstedt's scillain is pronounced by Van Renterghem a pure scillitoxin. Of this a dose of 1-10 milligram kills a frog, 2 milligrams a cat. It shows close analogies with digitalin.

Fronmueller pronounced scillipicrin a diuretic which had no superior. Out of 17 cases of grave oliguria treated with it 15 were successful. It was not suitable for hypodermic use, the irritation being too great.

Von Schroff found the action of scillitin bearing upon the ganglionic nervous system and the secretory organs, especially the kidneys and the respiratory mucosa. In massive doses it occasioned nephritis and gastroenteritis, with parenchymatous pulmonary hemorrhages. Lethal doses killed by ganglionic paralysis, especially of the heart. He placed this body with colchicine and helleborein.

Gubler found scillitin toxic in doses of gr. 5-6, smaller doses causing acute gastroenteritis. It acted as a violent emeto-cathartic.

Narcotism followed, and death from heart paralysis. Applied endermically it was quicker, and the effects almost purely narcotic. Koenig after long experimentation on animals obtained no toxic phenomena.

Huesemann concluded that squill in medicinal doses causes slowing of the pulse with a rise in arterial tension; lasting some hours; light laxative action with liquid stools; long-continued use disordered the digestion; no narcotic phenomena were noticed. Excessive doses caused nausea, vomiting, diarrhea, slowed the pulse to 40, prostration, narcosis, and convulsions. One dose of 22½ grains of squill killed a man. Toxic doses suppress the diuresis and cause hematuria.

In medicinal doses squill reduces the frequency of the heart and increases its force, as well as the vascular pressure, increases the excretion of urine, and of the respiratory mucus. Toxic doses cause gastrointestinal inflammation, and kill by paralyzing the heart. The active principle which most closely represents the plant is scillain (Van Renterghem).

Therapeutics.—Scillitin may be employed as a substitute for digitalin, over which it has some advantages—not cumulative, etc. It should not be given in irritative conditions of the kidneys, or of the stomach or bowels; even though Huesemann claimed that clinical experience did not warrant this contraindication. There are other remedies that will do the work, in case of doubt.

Scillitin has been employed in various dropsies, in combination with digitalin and calomel; and this has proved more effective than either agent separately. Give scillitin gr. 1-67, digitalin gr. 1-67, and calomel gr. 1-12, together, every two hours till the result is satisfactory. In advanced cardiac dropsies when other diuretics have lost their effects this combination will frequently prove surprisingly effective. But the principles of treatment of this malady comprise something far beyond the simple abstraction of a few ounces of serum from the body. If the dry diet, and elimination, are not comprehended, the results of any treatment will be but transitory.

Scillitin resembles sanguinarine in its power of increasing the sensibility of the respiratory mucosa, and making the patient cough harder. This and a slight increase of the mucous secretion comprise its effects in respiratory affections, and the combination of squill with sedatives like paregoric is one of the curious instances of incompatible mixtures common in the old polypharmacy. No case can be imagined that requires the two in the same case at the same time.

The dose of scillitin is gr. 1-67 every hour or two; or five granules every four hours, as a maximum.

SCUTELLARIN.

Standard granule—Gr. 1-6, gm. .01.

Scutellarin is a concentration from skullcap, Scutellaria lateriflora. It contains a glucoside obtained in acicular crystals by Myers.

Felter and Lloyd say that scutellaria is tonic, nervine and antispasmodic; which has proved especially useful in chorea, convulsions, tremors, intermittent fever, neuralgia, and many nervous affections. In delirium tremens it induces sleep. It is useful for the nervousness of teething children. In nervous excitability and restlessness or wakefulness, with or after acute or chronic maladies, from physical or mental overwork, or other causes, it is useful. It influences the cerebrospinal centers, controlling nervous irritation; hence its value in functional cardiac affections.

Specific Indications.—Nervousness, in or after diseases; or from exhaustion; or teething; nervousness manifested by muscular action; tremors, subsultus, hysteria, inability to control muscles; functional cardiac disorders purely nervous, with intermittent pulse.

Ellingwood recommends scutellaria for paralysis agitans, and with cimicifuga in chorea; for insomnia from restlessness or excitability, and in prolonged fevers; it promotes sleep and stimulates the kidneys and skin to increased activity. The soothing effect continues after the remedy has been discontinued.

The writer has employed scutellarin to some extent, and finds it closely resembling cypripedin and valerian in effects. It is a mild, comforting nervous sedative, relieving nervous restlessness as well as the bromides and without their destructive effects upon the digestion and the vitality. In fact, this remedy should be classed as a nerve strengthener instead of a sedative. Subduing nervous irritability is not sedation but rather lifting the function up to a plane where it can act normally.

The dose of scutellarin is from one to five grains, every hour till effect; the small dose is usually sufficient. Many times such a remedy is all that is sufficient, and strychnine is not needed.

SENECIN.

Standard granule—Gr. 1-6, gm. .01.

Senecin is a concentration from Senecio Jacoboea, or ragwort. Two alkaloids have been found in this plant, senecine and

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senecionine. Bunch found that it caused a rise in the vascular pressure, with constriction of the peripheral blood-vessels and those of the intestines. Under large doses the general pressure fell, the intestinal vessels dilated, and the contractions of the intestinal coats were inhibited. These effects were obtained from the alcoholic extract. The watery extract caused a fall of vascular pressure and cardiac inhibition (Shoemaker).

Senecin has been mainly employed as a regulator of menstruation; one of the popular titles of the plant being the Female Regulator. Delache and Heim found the solid extract act well, giving gr. 36 daily. Bardet and Bolognesis used it in 20 cases of amenorrhea and dysmenorrhea, and found it had the constant property of inducing the menstrual flow and relieving the pain. Murrell speaks highly of this agent as an emmenagog, first treating the anemia and then giving senecin. One of the names of this plant is "old man," and it has been advised for impotence, with doubtful benefits.

Felter and Lloyd consider senecio of value in female disorders, relieving irritation and strengthening function; promoting menstruation when there is no structural lesion; in dysmenorrhea, sterility and chlorosis; in menorrhagia given during the intermenstrual interval and at ovulation; for tenesmic and painful micturition of either sex; leucorrhea with weakness of the vaginal walls allowing uterine displacement, with engorgement; male genital disorders with pelvic weight and full, tardy or difficult urination, and dragging sensation in the testicles; for tardy digestion from congested or relaxed gastric mucosa; capillary hemorrhages, hematuria, and bloody albuminuria; pulmonary hemorrhages; an excellent diuretic in gravel, etc., specific in strangury; dysentery.

Specific Indications.—Atony of reproductive organs with impaired function; uterine enlargement, uterine or cervical leucorrhea; difficult tenesmic urination; dragging in testicles; perineal weight and fullness.

Ellingwood says senecin works best in a general hyperemic irritable and atonic condition of the pelvic organs; the results are not immediate; in engorged conditions of the male sexual organs, impotence, an active diuretic; of value in gonorrhea and gleet, and prostatorrhea, sexual irritability of the male; overcomes conditions that cause food to lie heavy on the stomach; acts in harmony with viburnum, helonias, aralia, mitchella, etc.

In the trials the writer has made of senecin he has had no re-

sults whatever, from doses up to five grains a day. It is evidently requisite that much larger doses should be given, and as it does not act very quickly, the remedy should be continued for a month or more.

SODIUM SUCCINATE.

Standard tablet—Gr. v, gm. .33.

Some 20 years ago the writer's attention was directed to sodium succinate as a remedy for gall-stones. He commenced its use for that malady, giving five grains before each meal and at bedtime, and continuing its administration for a year. The paroxysms of the disease became gradually less frequent and less severe, until within the period named they ceased entirely.

This experience has been repeated with every case seen by the writer since, and in all except two cases the above result has been attained. In one of these, a young woman with the intermittent febrile form, simulating malaria, the remedy was used intermittently and the test was not a fair one. In the other a physician came to the writer with the morphine habit from 25 years of this malady, and within a week the gall-bladder suppurated and surgical intervention was imperatively demanded. After years of suffering and many operations he is well. With these exceptions every case has recovered under the use of the succinate.

What does it do? We do not know. We have never had the opportunity to perform an autopsy on a man who had been taking the drug. Does it dissolve the calculi? We think not. Possibly it does. Does it subdue the catarrhal affection of the biliary passages and the duodenum? We think it does. It may act as an antiseptic or germicide, or in some other manner. All we know about it is comprised in the statement herein given. No theory is advanced; the practically unvarying success of twenty years is a phenomenon for the consideration and testing of our readers. As to the diagnosis, there have been a number of cases which had been diagnosed as gall-stones by the first surgeons of the country, and the knife presented as the only treatment worth consideration—even the date set for operation; and yet these cases are among those which recovered on the succinate treatment.

The succinate is not a remedy for the paroxysm.

Dr. W. H. Nunn writes that he attended a man with biliary calculi, and gave him the sodium succinate treatment. The man

never had another paroxysm. Many cases have been reported to the writer where others have obtained results fully equal to our own.

SPARTEINE.

Standard granules—Sulphate gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Sparteine is an alkaloid derived from Cytisus scoparius, or broom. Broom tops contain the volatile liquid alkaloid sparteine, and a crystallizable neutral principle, scoparin.

Cushny says that sparteine closely resembles cicutine in its effects, the central nervous system being but little affected by the former, which paralyzes the peripheral motor nerve ends, and probably the terminations around the cells of the sympathetic ganglia. Sparteine depresses the heart more than cicutine, making the rhythm slow and contractions weak. It increases arterial tension less than cicutine. Sparteine is very much less toxic than cicutine or gelseminine. It kills by paralyzing the ends of the phrenic nerves in the diaphragm. The diuretic action of broom is due to the scoparin.

Sparteine lowers reflex action. Shoemaker says it raises arterial tension for five hours.

Cerna found it caused a brief period of increased muscular irritability and reflex action, followed by depression; spinal convulsions, generally tetanic; first increased and then depressed the heart's force and rate; similarly increasing and later depressing the blood pressure. Death is caused by paralysis of respiration. See asserted that sparteine promptly and strongly reduced the size of the heart. He gave it for weak and irregular heart action, in doses of gr. 1-6 to 1-4 every four hours, especially in heart failure from mitral disease. In irregular heart action it proved serviceable. Gluzinski found doses under a grain best.

Shoemaker speaks well of sparteine as a cardiac tonic, in the cases where digitalin is usually administered. It has been recommended in exophthalmic goiter, tobacco heart, to prevent uremia, in angina pectoris, chorea with endocarditis, rheumatic heart diseases, the withdrawal symptoms following stoppage of morphine, as a preliminary to chloroform anesthesia in patients with weak or diseased hearts, to regulate the disturbed heart in young consumptives, etc.

There is here a curious contradiction. If sparteine can be given with advantage to the diseased hearts before chloroform anesthesia, there is hardly a doubt that it acts as a cardiac tonic. Possibly

Cushny's conclusions are based on Schmiedeberg's experiments on animals with much larger doses than are given in the cases described. The writer has given sparteine as a cardiac tonic in doses below a grain a day, and found it especially beneficial in aged persons where it is necessary to continue the remedy longer than he cared to use digitalin.

Sparteine acts as a diuretic by increasing the vascular tension in small doses, as is the case with digitalin. Scoparin is a direct and powerful diuretic, increasing the quantity of urine and the excretion of urea.

STROPHANTHIN.

Standard granule—Gr. 1-500, gm. .000125; gr. 1-134, gm. .0005.

Strophanthin is a glucoside derived from Strophanthus hispidus, and some other species of strophanthus. Several principles have been isolated from the various species of strophanthus, and the name has been applied to derivatives differing in their strength even to the ratio of one to 90. It is absolutely essential that but one of these should be employed, to obtain uniformity and safety in its use. Arnaud's strophanthin has the formula $C_{21}H_{48}O_{12}$. Fraser considers it the only active principle of the plants, looking on strophanthidin as a decomposition product. Strophanthin is a crystallizable glucoside, soluble in water and in alcohol. It is a more powerful local anesthetic than cocaine. It causes passive congestion and may cloud the cornea. It is bitter and in small doses promotes digestion. As a cardiac tonic it closely resembles digitalin, and a detailed account of its action would simply repeat what has been said at length under that head. The principal difference in their action is in the effect upon the vascular pressure, which is raised by digitalin much more than by strophanthin. In fact, the only increase in the arterial tension caused by the latter is what may be caused by the increase in the force of the heart and the consequent greater quantity of blood driven into the vessels.

Strophanthin does not disturb the digestion, nor has it any cumulative effect, that bugbear of the older physicians who did not employ the Germanic digitalin. The tonic effect is not so enduring as that of digitalin. The quieting effect on the nervous centers attributed to strophanthin is simply that seen after any cardiac tonic rightly administered.

If given continuously for some time diarrhea is apt to result.

Fraser specially recommended strophanthus in affections of the

right heart, and of the aortic valve, where digitalin is contra-indicated. Wilcox says success in its use demands a good preparation, its use in not too large or too frequent doses, avoidance of it in fully or over-compensated hearts, or in those presenting advanced muscular degeneration or mechanical defects of high degree. He considers it the drug of choice in all cases when we wish to establish compensation; all cases of arterial degeneration when more energetic cardiac contraction is required; all cardiac cases where diuresis is desired; all weak or irritable hearts; and all cases of heart disease in childhood or old age. This leaves little room for digitalin. But Balfour denies most of this, holding that when heart cases require anything beyond rest, they need a remedy to restore the elasticity of the heart muscle, and this digitalin does best.

Strophanthin has been advised in bronchial asthma, whooping-cough, hypodermically in chills of nervous character, malarial, and urethral. Uremia and dyspnea of nephritis are relieved by this remedy. It has succeeded in exophthalmic goiter, where it was given in very large doses.

If strophanthin causes cold sweating and nausea, coffee and stimulants should be given.

The dose of strophanthin should be regulated by the effect on the pulse. One of the weaker granules may be given every hour or two till the desired cardiac tonicity has been attained, and then often enough to keep up this effect. If the stronger granules are used one every four to six hours is the dose for an adult at the beginning, and this should not be exceeded until the tolerance has been ascertained.

STRYCHNINE.

Standard granules—Arsenate gr. 1-134, gm. .0005; gr. 1-67, gm. .001; gr. 1-30, gm. .002; hypophosphite gr. 1-134, gm. .0005; nitrate gr. 1-67, gm. .001; sulphate gr. 1-134, gm. .0005; gr. 1-67, gm. .001; gr. 1-30, gm. .002; valerianate gr. 1-134, gm. .0005.

Strychnine is an alkaloid derived from Strychnos nux vomica. With it is found the closely allied alkaloid, brucine. In the same group we place thebaine, calabarine, laudanine, and curarine; while several other less known alkaloids are probably to be placed here also. None of these has been studied as thoroughly as strychnine, and it is possible that each may sometime be found to fulfill some functions better than the others. Meanwhile strychnine has come into such general and extensive use that it behooves every practician to

study its actions and powers to the fullest extent, that he may be able to recognize its effects, remedial and toxic, at a moment's notice.

Physiologic and Toxic Actions.—When a toxic dose of strychnine is taken the first effect is sharpening of the special senses, with stiffness of the muscles of neck and face. The reflexes are increased, and slight irritations cause quick and powerful movements. Tremors or twitchings of the extremities occur, and are followed by general convulsions, the extensors especially being thrown into action. The head is retracted, opisthotonos appears, with the sardonic grin. Respiratory spasm causes cyanosis. The muscular spasms alternate with relaxation, when the reflex irritability is low. After two or three convulsions death occurs, the respiration not being resumed. In some cases the convulsions subside but death occurs from asphyxia. Very large doses cause death by paralysis of the nerve centers without convulsions.

The action is directed to the central nervous system. The cord is affected more than the cerebrum. The intellect is not directly affected and the pain is exquisite. Not only are the special senses made more acute but the field of vision is widened, and shades previously indistinguishable can be recognized.

The convulsions are due to stimulation of the spinal reflex function. They may be prevented by excluding external irritations. The tone of the medulla is increased by small doses, and affected by large ones as is the cord. The tendency to convulsions is lessened by rhythmic movements of any description. No direct effect is exerted on any of the voluntary muscles.

Large doses paralyze the motor nerve ends, by direct action. Small doses quicken and deepen the respirations. The heart is not directly affected by strychnine, but stimulation of the center of inhibition slightly slows it. The peripheral arterioles are contracted by stimulation of the vasoconstrictor center. Remedial doses raise the vascular pressure and slow the pulse. During convulsions the pressure rises very high, from the direct action and from the blood being forced out of the abdominal vessels by the violent contraction of the muscles. The vasoconstriction is greatest in the internal vessels, those of the skin and possibly the muscles being dilated. Cushny attributes this to stimulation of vasodilator centers in the medulla. The heart beats long after respiration ceases, and artificial respiration may keep it beating indefinitely.

Strychnine acts on the stomach as the other bitter tonics, in small doses; and is absorbed from the intestine.

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From the enormous increase of muscular activity strychnine raises correspondingly the excretion of carbonic acid and absorption of oxygen. No rise in temperature is caused, as the dissipation of heat through the skin is even more increased. The internal temperature falls a little while that of the skin rises. Even small doses cause the glycogen of the liver and muscles to disappear (Demant).

Strychnine is eliminated mainly by the kidneys, the process lasting a week or more. Part is excreted into the stomach and part oxidized in the tissues. The continued use of strychnine begets a certain degree of tolerance. Trousseau gave it in ascending doses up to and exceeding a grain a day, to adults. Man is more susceptible to it than animals, and the young are more susceptible than the old.

Strychnine stimulates the peristaltic movement of all the hollow viscera, intestines and bladder. Large doses may cause diarrhea. The pupil is dilated. Small doses promote the amylolytic action of the pancreatic juice while large doses suppress its secretion. The genital functions in both sexes, the menstrual flow, testicular secretion, erectile power and venereal appetite, are increased by strychnine.

The absorption of strychnine is more rapid when given by the rectum than by the stomach. The elimination of this drug by the saliva and other alimentary secretions tends to accumulate it in the system as it is reabsorbed from the lower bowel. Stocker found flushing of the face, throbbing head, vertigo and faintness to be the evidences of beginning toxic action, or saturation.

The slowness of its absorption and elimination renders it wise to suspend the use of strychnine for intervals. It inhibits the movements of the leucocytes, though much less than quinine. A bright red eruption is mentioned by Shoemaker as having been exceptionally caused by strychnine.

Death has resulted from half a grain of strychnine, and from three grains of extract of nux vomica; but six grains of strychnine have been taken without the fatal result. Recovery is the rule if the patient survives three hours.

Falconer reported a case of chronic poisoning, the symptoms being extreme weakness, muscular pains, stiffness of the back of the neck, clonic convulsions of the forearm with contractures of the finger flexors, vertigo, amblyopia, and weak but regular pulse. She had taken gr. 1-30 four times a day for eight months up to her death.

The diagnosis of strychnine poisoning may be made by the tonic convulsions, never clonic as in epilepsy; the jaw is not first attacked as in tetanus; in tetany other than the cervical muscles are affected with persistent rigidity; in hysteria the contractions are painless, and the history and aspect of the case are radically different; in hydrophobia the mind is affected, and the history and duration of the attack differ.

The chemical antidote to strychnine is tannic acid. Shoemaker speaks of cold tea or coffee as being available sources. The stomach should be soon washed out or vomiting induced, as the tannate of strychnine is slowly soluble. Anesthetize the convulsed patient before trying any manipulation. The chloral group are antidotes, with physostigmine and possibly pilocarpine. All relaxants are antagonistic, such as tobacco, alcohol, cicutine, morphine, glonoin, etc. Turner claimed that lard was a remedy, but this seems to be simply a means of delaying absorption.

Therapeutics.—Strychnine stands at the head of remedies for poisoning from venomous snakes, of all varieties. The effect of the venom is a paralysis of the vasoconstrictors of the abdominal organs, by which the blood from the whole body is heaped up in the abdomen, and the patient dies from cerebral anemia. This effect is directly antagonized by strychnine. It must be given in full toxic doses and repeated as required, without reference to its ordinary dosage. The discoverer urged from gr. 1-5 to 1-3 hypodermically as a first dose, and then enough to keep up the toxic rigidity secured. The failures are due to the fear or carelessness by which this dosage for effect is not persisted in until the danger is past. The paralysis keeps recurring for days perhaps, and the dosage requires intelligent, fearless and persistent repetition.

The close similarity between the symptoms of snake poison and those of the Amanita phalloides, the deadliest of poisonous mushrooms, has led to the use of strychnine similarly. This is strictly correct, and we expect similarly good results to accrue. A somewhat similar condition exists in persons overcome by enormous quantities of alcohol, as where fools bet on their ability to drink a pint or quart of whisky at a draught. The hypodermic use of enough strychnine affords the best chance of saving the life.

In doses of gr. 1-67 any of the salts of strychnine forms a good bitter tonic for weak digestions, but it is better to save this great remedy for great uses, and employ the equally efficient and far safer quassin for an appetizer. In very small doses, gr. 1-500 of the

arsenate is best, it is useful for many forms of vomiting, that of pregnancy and of drunkards especially. Give every hour till toned up enough. When alcohol has been used habitually and an effort is made to break off the habit, there is a miserable sense of debility, of utter prostration and nervelessness, mental and physical; and this is best met by strychnine in doses sufficient to put the whole system in tone like a violin string in tune. This may require but little, or enough to make the timid therapeutist, unaccustomed to dosage for effect, quake in his boots. Much or little, there is no danger of the remedy if given as really needed; and too often the treatment fails from timidity or rashness. Capsicum is the best adjuvant.

Gastric catarrh and dilatation of the stomach are relieved by small doses of strychnine continued some weeks, with carefully regulated diet. No possible benefit can accrue from any medication if the patient continues to distend his stomach with food and cold drinks, etc.

Hemorrhoids and other evidences of an atonic state of the large bowel, are relieved by moderate doses of strychnine, with suitable diet and laxatives. Chronic diarrheas and dysenteries continuing from relaxation, often respond nicely to a little strychnine.

There is no more effective or speedy heart stimulant than strychnine, which many prefer to digitalin. The doses must be carefully regulated, and large ones in fatty hearts may kill. In many cases an alternation is advisable.

In cardiac asthma there is no remedy comparable in effect to strychnine arsenate, if given to full toleration. This may require up to near a grain a day; but it is imperative that no more than actually needed be given. Sometimes it must be continued for months; but other measures, diet and regulated exertion, and climate, should be utilized so as to render the use of this priceless boon as limited as is actually necessary. For the true physician must ever distinguish between temporary improvement and actual cure; between the stimulant that rallies the last reserves, and the real increase in the vital forces.

And this last remark leads us to speak here of strychnine as a remedy for sexual weakness. It is a disaster for man or woman to get hold of this bit of information without the further knowledge that governs and corrects it. Humanity wants increased sex power, despite the notorious fact that most men and some women would be the better for having a good deal less. Strychnine cannot bring back youth, nor indeed increase the vital stock. It simply rallies the

reserves, to be used wisely by the very few, to be more quickly wasted by the foolish many.

Strychnine fills an important place in the treatment of paralyses. When an apoplectic effusion has occurred, some nerve fibers are torn asunder, others are compressed by the effused blood, by the zone of inflammation surrounding the site of injury, and by the zone of œdema surrounding that. Recovery from the compression from each goes on more slowly than in the one outside. Some fibers do not resume their functions even when the pressure is removed. Strychnine comes in here, to arouse the nerves and restore their tone. In the latter respect it is better than electricity. It should not be given till the first period is past, that when we try to limit the effusion; not in the second, when we are promoting its resorption; but after six weeks have elapsed we begin cautiously with small doses, and increase cautiously to full tolerance. And the word "cautiously" is repeated purposely.

All forms of paralysis come under this treatment. Strychnine will do all that medicine will, for these cases.

Mays has urged strychnine as the chief remedy for phthisis; and as to its efficacy, when the alimentary canal has been rendered aseptic, there is no doubt. But we have not found in it specific virtues.

Strychnine has been used with benefit in all forms of amaurosis; neuralgias of all descriptions, where full doses often break up the pain habit; chorea; epilepsy; etc.

A general tonic, one that improves the tone and increases the function of every tissue and organ in the human body, it would be strange indeed if it were not abused. We are now in the strychnine epoch, when everyone gets strychnine for everything. Many a case of strychnine habit exists, as yet unrecognized. Many a case of chronic poisoning we fear goes to the grave unrecognized. The lazy doctor adds this to his morphine and whisky, and finds he has his needs amply supplied; with an occasional dose of salts. Against this tendency the best defense is the disposition to nicety acquired through the use of the alkaloids. As one becomes accustomed to certainties in effects he needs more and more remedies by which exactness of indication may be exactly met therapeutically.

In treating the alcohol habit the nitrate of strychnine has been preferred to the other salts. It is quite soluble and easily given hypodermically.

The hypophosphite of strychnine has been advised when this

remedy is employed as a reconstructive tonic, especially in the young, and when combined with other hypophosphites, of lime, iron, quinine, etc.

Strychnine arsenate combines the properties of these two great tonics, and is most extensively employed when vital incitation is indicated. The dose as to strychnine is about two-thirds as strong as the sulphate, hence the granule of gr. 1-67 about equals gr. 1-100 of the latter.

It has seemed to the writer that the response from strychnine valerianate came more promptly than from any of the other salts. Small as is the quantity of valerianic acid in the dose, it is not without activity, and in nervous and hysteric cases, and when given as a bracer, a restorer of tone in conditions of hypochondria, neurasthenia, spermatorrhea, and the consequences of mental overwork, this salt has proved eminently satisfactory.

In all but emergencies where it is essential to obtain maximal effects as quickly as possible, it is wise to use very small doses of strychnine and gradually repeat until the desired tonicity has been secured. This avoids all danger of overdosing, of striking an idiosyncrasy, and begets in the physician the habit of closely watching his patient's symptoms, which is not so universal as one could wish. Even with alcoholics the response to strychnine may come with incredibly small doses; and on the other hand these people may require almost incredible doses to equalize the nervous pressure and restore that springlike tonicity that does so much to encourage him to persist in his reform. Many reformed inebriates emerge from the "cures" with the strychnine habit. This may be gradually shaded down into brucine, and this into berberine; but even if not, it is surely preferable to the whisky habit.

During the past decade strychnine has come generally into use as a means of sustaining the vital forces and the heart especially, during the course of fevers. In pneumonia it may be termed the chief reliance of many physicians. This matter has been fully discussed in the chapters on aconitine, digitalin and veratrine, to which the reader is referred. In all febrile maladies when there are any signs of adynamia approaching, the rule is to forestall danger by adding a sufficiency of strychnine; and many a life has been saved by this wise forethought. But that does not mean a senseless administration of this powerful drug where it is not needed. There is a place for veratrine as well as for strychnine.

In constipation strychnine is a useful ingredient of every really valuable combination for the cure of this malady.

And yet the half has not been said. Every physician of wide experience can add instances of the fitness of this most powerful agent for special conditions not mentioned in this article.

VERATRINE.

Standard granule—Gr. 1-134, gm. .0005.

Of the veratrine group veratrum viride has won the strongest hold upon the medical profession, whose confidence in it has not been shaken by adverse reports, the introduction of German synthetic antipyretics, or even the dreadful accusations of "eclecticism" and "homeopathy." The alkaloidal representative of the green veratrum is generally assumed to be veratrine. We propose to examine this question and ascertain whether this substance really represents veratrum viride therapeutically; and if not, whether either of the other bodies extracted from this group of plants more nearly represents the desirable qualities. For the galenic preparations of veratrum viride are no exceptions to the rule, that all plant-extracts, tinctures, etc., contain their active principles in uncertain and variable quantities and proportions, and hence are fatally wanting in the scientific precision of their application for the cure of the sick.

Veratrum viride contains a little veratrine, pseudojervine. cevadine and veratralbine, with a good deal of jervine, and rubijervine or veratroidine. To the latter two its effects are mainly attributable.

Cevadilla contains veratrine, sabadine, cevadilline, sabadinine and Wright's veratrine. Of these veratrine alone has been studied carefully. The others have not as yet been shown to possess any other importance than as weakening the official veratrine by their presence in variable proportions.

Merck lists: 1. C. P. crystallized veratrine or cevadine (soluble in alcohol and ether); 2, Veratrine, U. S. P., containing the other cevadilla alkaloids but in too small proportion to affect the dosage; 3, Veratrine amorphous; 4, V. acetate, hydrochlorate, nitrate, sulphate and valerianate; 5, Jervine; 6, Sabadilline, C_{21} H_{27} NO_7, soluble in alcohol, chloroform and benzole, and in 143 parts boiling water; dose twelve times that of veratrine (Urpav); 7, Sabadilline sulphate, soluble in water or alcohol; 8, Sabadine.

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$C_{29}H_{51}NO_8$, soluble in water, alcohol or ether, also its salts; 9, Sabadinine, $C_{27}H_{45}NO_8$, soluble in water, alcohol, ether or chloroform; also the hydrochlorate, bisulphate and an amorphous form.

Physiologic Action.—Veratrine, $C_{32}H_{49}NO_9$ ($C_{37}H_{53}NO_{11}$, Bruehl), is quite soluble in hot water and alcohol, slightly in cold water. It is absorbed from the skin, the mucous membranes and the subcutaneous tissues. It is rapidly eliminated by the kidneys, and also by the gastrointestinal mucous membrane, the latter being irritated by its passage. When inhaled, veratrine causes dry, irritative and fatiguing cough. Applied to the nasal mucosa it causes violent and prolonged sneezing. Even a granule containing half a milligram, allowed to dissolve in a child's mouth, has raised vesicles. Applied to the unbroken skin, veratrine does not cause redness, but a sensation of burning and prickling, followed by cold and formication, with anesthesia.

Given in moderate doses by the mouth, veratrine increases the excretion of urine, perspiration and saliva, and if continued or increased causes a sense of warmth in the stomach, with burning, nausea, colic, vomiting and diarrhea. Persons unusually susceptible to its action have bloody stools and vomit. The prickling extends over the entire skin, followed by anesthesia and free sweating. Van Renterghem took 0.0005 every half-hour, for 36 hours, without experiencing diarrhea, vomiting or any toxic symptom.

Toxic doses cause dilatation of the pupils.

Veratrine exercises a deleterious effect upon certain protoplasms, in which it resembles quinine (Kuen and Scharrenbroich). The lymphatics are thereby rendered less hospitable to microbes; or perhaps the latter are attacked by the veratrine (Van Renterghem).

Absorbed through the skin, veratrine may cause diuresis instead of purging (Bardsley).

Small doses quicken the pulse and respiration and raise the blood-pressure, but larger or repeated doses reverse all these.

The temperature is lowered from the start.

At first the vasomotor centers, the peripheral inhibitory nerves and medullary centers are stimulated, later they are paralyzed (Hare).

Toxic doses cause continued weakening of the heart and respiration, which finally cease almost simultaneously. The pulse becomes slow and irregular, breathing slow and labored. Fibrillary contractions of the muscles are frequent, with convulsions, followed by collaspe, unconsciousness and death by respiratory failure (Cushny).

The nausea may in part be due to direct irritation of the gastric sensory nerve-ends, but is probably due in the main to central irritation. The salivation may be primary, or due to the nausea. The purging is attributable to action on the intestinal nerves; perspiration to stimulation of the nerve-ends regulating secretion of the sudoriparous glands (Cushny).

The most marked peculiarity of the action of veratrine, is its effect upon the striated muscular fiber. The contractions are strengthened and continuous, relaxation being so slow that coördination is impaired. The relaxation occupies 20 to 30 times the normal period. If the muscle has been fatigued, veratrine causes marked improvement in its contractions. This effect of veratrine is in turn removed by fatigue, or by severe cold or heat; while moderate heat increases or prolongs the effect of the drug (Cushny). Thus, the febrile temperature alters the action of veratrine (Brunton). The heat generated by exercise is increased by veratrine. Both the irritability and the absolute strength of the muscles are increased by veratrine. In the frog, the muscle is finally paralyzed, but in man the respiratory failure occurs long before this is due. This action is peripheric, as it occurs in muscles that have been excised. It is attributed to an increase in the katabolism in the muscular cells (Cushny).

Applied directly to the peripheral nerves, their irritability is abolished (Waller).

The ventricular muscular apparatus in frogs is affected like the striated muscles, but the auricular fibers much less. The ventricular systole is at first strengthened and prolonged, then the period of contraction is lengthened until one ventricular rhythm corresponds to two of the auricle. Later the contractions become slower and weaker until they cease. In this the action is analogous to that of digitalis. Stimulation of the cardiac inhibitory center slows the heart, lessening its output, the peripheral vessels contracting through central vasomotor stimulation. With larger doses the vagus-ends are paralyzed, its center depressed, the pulse is faster, the tension lowered. No prolongation of the systole is seen, but a slight stimulation, since maximum doses quicken the rhythm even after atropine. Veratrine resembles aconitine as to the circulation, but without stimulating the cardiac muscle (Cushny). The heart stops in diastole (Hare).

Respiration: The action closely resembles that of aconitine, death being by both caused by respiratory paralysis (Cushny).

Central Nervous System: Stimulated as by aconitine, large doses ending in paralysis. The medulla and cord are more affected than the cerebrum, consciousness ending only in death.

Temperature: Lowered by slowing of circulation, unless convulsions are marked, when the temperature is raised.

Veratrine increases reflex excitability (Brunton).

The convulsions of veratrine are always tonic, never clonic or epileptoid. Tetanic spasms are excited by the slightest touch or breath of air (Hare).

Veratrine lessens oxidation somewhat (Brunton).

The peculiar prickling caused by veratrine is felt in the fingers, toes and joints; that of aconitine in the tongue (Brunton). It stimulates the nerves of ordinary sensation and the pulmonary branches of the vagus; the slow pulse caused by it being lessened or abolished by section of the vagi. Stimulation of the vasomotor center is shown by the rise of blood-pressure, ceasing on section of the cord below the medulla; though subsidiary centers exist in the cord itself. Small doses stimulate the cardiac muscle, causing increased energy of contraction, the pulse remaining the same or slower. Larger doses induce a following stage of peristaltic action, and stoppage in either systole or diastole (Brunton).

The effect of veratrine is weakened when it is passed through the liver (Sollmann).

In chronic poisoning the patient becomes weak and thin, with bloody diarrhea, insomnia and delirium (Sollmann).

OTHER VERATRUM ALKALOIDS.

Jervine is soluble in alcohol only. It causes sluggishness, progressive muscular weakness and lessened reflexes, violent general tremors, ending in convulsions, with violent motion but loss of power; not tetanic, paralysis rapidly supervening; pupils unaffected, no purging or vomiting, profuse salivation, no local irritation, consciousness continues to the last, death from asphyxia.

The convulsions are cerebral and due to disturbed cerebral circulation. The loss of muscular power is due to spinal depression; the peripheral nerves and muscles are unaffected. It is a direct depressant of the respiratory centers and of the circulation. The pulse at first is slowed; later is faster. The blood-pressure falls from first to last. The action is not affected by vagus section. Direct depression of heart-muscle or its ganglia is caused by any dose. It depresses the vasomotor centers.

Summary: A powerful depressant of the heart and vasomotor centers, also of the motor spinal and respiratory centers, with little other effect on the body (Wood).

Veratroidine or rubijervine is more irritant than jervine. It usually causes vomiting, sometimes purging, before a fatal dose is absorbed. It does not cause such severe convulsions. Death occurs from paralysis of the respiratory center. It resembles jervine in action on the cerebrum, cord, peripheral nerves and muscles. The circulatory effect is subordinate to that on the respiration. Toxic doses cause an enormous rise in arterial pressure. After section of the vagi, it could not slow the pulse. After intoxication with it, division of the vagi caused enormous rapidity of the pulse. It stimulates cardiac inhibition powerfully, like aconitine. The vasomotor centers are unaffected.

Summary: A powerful respiratory poison, at first slowing the pulse-rate by stimulating the pneumogastrics, but soon losing control of the heart in powerful respiratory paralysis. "The action of veratrum viride is the result of the combined influence of its alkaloids, and as the relative proportions of these differ in different rhizomes, so in the finer details of its physiologic action one specimen of the veratrum viride differs from another" (Wood).

Protoveratrine, $C_{32}H_{51}NO_{11}$, is the principal alkaloid of veratrum album, the others being jervine, rubijervine, pseudojervine and protoveratridine. Locally it causes less sensory irritation than veratrine, and the anesthesia following is more complete. It does not paralyze the motor nerve-ends in maximum doses. It shortens the muscle-contractions, which are higher, the absolute strength increased, but fatigue follows more quickly than when the drug is not used. It is much more toxic than veratrine, approaching aconitine in strength, while standing between it and veratrine in action. With the rubijervine, it renders white hellebore more irritant to the stomach and bowels than either cevadilla or green hellebore; but this is not uniform, as some cases of poisoning were not marked by severe gastrointestinal action.

Therapeutics.—Both Schmiedeberg and Liebermeister condemn the internal use of veratrine; but Van Renterghem says: "One should not forget that the rise of arterial pressure and the great loss of heat by the skin occasioned by fever, mean something; for this increase of intravascular tension does not necessarily imply an increased oxidation in the tissues, as has been claimed. But it is certain that the state of depression of the circulatory functions oc-

casioned by fever adds a very serious factor to the other causes of fever heat; and that veratrine, prudently administered, suppresses this state and with it its consequences. We possess in our arsenal no medicament as powerful, as sure, as manageable to combat fever, especially acute rheumatism and croupous pneumonia."

We have in this pregnant sentence the key to the uses of veratrine in febrile conditions. "It is especially in acute maladies that its action is powerful. Since its introduction in our hospital practice, there has been no fever or inflammation that we could not direct to resolution" (Burggræve). "We have always succeeded, grace to it, in producing defervescence, in lowering the most intense fever, in conjuring an imminent inflammation, restraining its development, or mitigating its effects. It has served us with equal success in typhoid fever, puerperal fever, pneumonia, the exanthemata, etc." (Van Renterghem).

A second indication for veratrine is found in its power of causing sedation of the cutaneous sensory nerves. Burggræve called it "the refresher of the skin," and advised it in erythema, erysipelas, zoster, pemphigus, eczema, ecthyma, urticaria, phlyctenular herpes, febrile aphthæ, boils, carbuncles and malignant pustule; in the latter with the cautery and other indicated remedies. Van Renterghem obtained success from veratrine in pruritic maladies generally. The sedative action of veratrine upon the nervous system renders it suitable in treating neuralgias, the violent pains of rheumatismal ophthalmia, and sciatica. The success following its use in alcoholic tremor, typhoid convalescence, multiple sclerosis (Feris), chorea (d'Oliveiro, etc.), and tetanus (Harris), may be explained by the action of veratrine on striated muscular fiber. Turnbull and Gintrac gave it in cardiac affections, arthritic and rheumatismal, and for palpitation.

In eclampsia veratrine may well replace the tincture of veratrum viride, which is the most trusted remedy of the profession in this dangerous malady.

Externally veratrine is employed in the form of an ointment, applied over the course of diseased nerves, with the object of producing analgesia; in various neuralgias, facial, lumbar, spinal and coccygeal.

The dose for internal administration is given as 0.0015 to 0.005 (gr. 1-45—1-12) three times daily, and 0.02 (gr. ⅓) *per diem*. It is little wonder that with such dosage this inestimable remedy has fallen into disuse, and gained the repute of a dangerous weapon.

Many persons may be found who cannot take the smallest of the doses named, without unpleasant effects. Except in eclampsia, the dose of 0.0005 (gr. 1-134) should never be exceeded; and this if given every quarter to one hour until the desired effect has been secured, will amply meet every requirement. In every sthenic febrile attack let the bowels be emptied and the alimentary canal rendered aseptic; then administer veratrine, 0.0005, alone or with digitalin and aconitine, or whatever else is indicated. The speedy solubility of veratrine, its rapid elimination, and its power of unlocking every channel of elimination from the body, even when closed by disease that renders ordinary medication perilous, places this remedy in advance of every other. In cirrhotic kidney, when ⅛ grain of morphine or one grain of calomel may cause death, veratrine not only provides for its own elimination but renders the administration of other remedies safe. In eclampsia alone should the dose be exceeded. Here the local irritation following the hypodermic application of veratrine must be disregarded, and 0.005 (gr. 1-12) given at once, in diluted alcohol, to powerfully stimulate elimination, and save the brain from the imminent peril threatening it. In other forms of uremia, in diabetic and icteric coma, the same administration should be employed, with due watchfulness. True, the heart's force must be kept up, but that matters little if the brain is overwhelmed by toxins. Veratrine and the normal saline solution meet the need better than any other known remedies.

Given internally in the doses recommended (0.0005 every quarter to one hour), veratrine should be continued until the first faint intimation of nausea is manifested; then withheld until this has disappeared, or until again indicated by the symptoms. If the stomach develops an idiosyncrasy against veratrine, codeine, 0.005, may be administered with a few doses, provided the pulse and fever show the antipyretic is still needed. When one has utilized veratrine, in this strictly scientific method of administration, for several years, and become thoroughly familiar with its properties, its tremendous power, its safety, its perfect manageableness, he can only hear with amazement the condemnation of this alkaloid by men who have good repute as therapeutists.

Externally an ointment of veratrine, 0.2—0.5 to 25 grams of any desired base, may be employed.

Synergists.—Aconitine as a defervescent, antiphlogistic and antineuralgic. Cicutine, curarine and digitalin, as to the action on striated muscle fiber, on the motor nerve-ends and on the heart-

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muscle. Quinine and strychnine for the action upon protoplasm. Colchicine has a similar action on the sensory nerve-ends, but in other respects departs too widely to be ranged in the same class.

Antagonists.—The strychnine group against the respiratory and vasomotor paralysis, the debility and vital depression. Codeine sedates the gastric irritability, lowers topical irritation, and renders veratrine better tolerated.

Chemical antidotes: Tannic acid, iodine, potassium iodide.

Physiologic antidotes: Stimulants, coffee, heat, rest.

"When true sthenic arterial excitement is to be combated in any disease, except gastritis, veratrum viride may be employed as a prompt, thoroughly efficient and at the same time very safe remedy —very safe, since it is almost incapable of producing death in the robust adult. In the early stages of sthenic pneumonia, it offers, we believe, the best known method of reducing the pulse-rate and the temperature, and of lessening the congestion.

"In chronic cardiac diseases it may be used in precisely those cases in which digitalis is contraindicated—i. e., when there is excessive hypertrophy. Over-doses provoke vomiting, so soon and so certainly that it is doubtful whether a robust adult could be killed by a single dose" (Wood).

Veratrum viride is the safest and best circulatory depressant that we have for use in adults. "The physiologic action is to be considered under the effects of its two alkaloids" (Wood).

Shoemaker recommends veratrine ointments for neuralgia, myalgia, zoster and infantile paralysis; chronic arthritis and acute gouty attacks; in pleurodynia, chronic pleurisy, alopecia circumscripta, chloasma and pediculosis. The officinal ointment is two or more times too strong.

Veratrum viride Shoemaker advises in aneurism, exophthalmic goiter, early stages of pneumonia and acute visceral congestions; acute hemorrhage and mania, in plethora, in typhoid only with hyperpyrexia and active delirium, in tonsillitis, and to moderate traumatic abdominal inflammations. Phillips gave it for obstinate priapism.

Ringer says it is given for congestive headaches at the menstrual period.

Ringer applied the ointment for sick headache, when accompanied or followed by tenderness of the skin.

Turnbull found the ointment sometimes relieve rheumatic joints; also applied it over ailing hearts, with rapid irregular pulse, hurried

breathing, much lividity and dropsy, palpitation and inability to lie down. Here it acts as a diuretic.

Hare says that the safety of veratrum viride lies in the fact that it excites free vomiting and purging, long before the heart or lung paralysis is reached.

VERBENIN.

Standard granule—Gr. 1-5, gm. .0012.

Verbenin is an extract from Verbena hastata, the garden verbena. The root of the wild verbena is the part used.

Felter and Lloyd pronounce verbena tonic, emetic, expectorant and sudorific. In small doses it relieves gastric irritation. Like other diaphoretics it has proved useful in intermittents, and to break up colds and restore menstruation when stopped as a result of taking cold. As a tonic it is useful in debility, anorexia, and in convalescence from febrile affections. It has also been recommended in scrofula, visceral obstructions, gravel, and for worms.

Other species of verbena are said to possess similar properties, though in a less degree. Agnus castus, a European member of the Verbenaceæ, is considered galactagog and emmenagog, and is also believed to possess the rather contradictory property of subduing the sexual passion. It has also been suggested as a remedy for impotence and for sexual melancholia; possibly may be useful in sexual irritability and nervousness or melancholia, or mild dementia. Castus indicus has been given for venomous bites and stings, and in very small doses for giddiness and salivation.

Dr. H. D. Fair some years ago announced in *The Alkaloidal Clinic* that verbena had proved remarkably effective as a remedy for epilepsy. Subsequently Prof. G. H. French found the plant possessed some repute among the laity as a remedy for this malady, and tried it with success in some cases. Since that time the extract, verbenin has been extensively tested, and in a number of cases with success. The writer has given it to a number of epileptics, and is satisfied that there is remedial value in it. Some cases have gone months without convulsions while taking verbenin, and in one case where the spasms occurred at least once a month, a year has elapsed without any convulsions. But in other cases the remedy has had little or no effect. And as yet it has not been ascertained just what verbenin does, how it acts in epilepsy, what cases are amenable to its influence, or in fact what effect it exerts on the bodily functions. Verbena has been recommended as a remedy for intestinal worms.

Possibly in some cases a vermifuge or vermicide action may be exerted, as Prof French at first believed he had found the cause of epilepsy in an intestinal parasite, the larva of a botfly. But it has not yet been shown that epilepsy is due in any great proportion of cases to this or to any parasites, though some undoubtedly are. Nor has it been shown that verbenin possesses any action on these parasites.

The whole question deserves investigation. At present we must rest content with the knowledge that verbenin ranks among the drugs that exerts an influence over epilepsy, restraining the convulsive tendency better than any other remedy except the bromides in many cases, and without the destructive effects of the latter upon the digestion and the nervous system.

The dose of verbenin has not yet been fixed. The writer has advised gr. ss four times a day as a beginning adult dose, adding one daily dose of the same size whenever a convulsion occurs. The average effective dose has been ten grains a day, but some have risen to gr. 20, a day, without any symptoms occurring that could discommode the patient. But no scientific study of verbenin has been made, not even to ascertain its effects upon the excretion of uric acid.

VIBURNIN.

Standard granule—Gr. 1-6, gm. .01.

Viburnin is a concentration from Viburnum prunifolium, the black haw or sloe, a native plant of the honeysuckle family. The bark contains two resins, one of which has also received the name of viburnin.

Felter and Lloyd say that large doses cause vomiting. It has been termed nervine, antispasmodic, tonic, astringent, diuretic and alterative.

As an astringent it has been used in diarrheas and dysenteries. Useful in jaundice, chionanthus is better. It relieves palpitations, sympathetic, occurring near the menstrual periods. It is of great utility as a uterine tonic. It restores normal innervation, improves the circulation, and corrects impaired nutrition of the genital apparatus of women. In the hyperesthetic irritable uterus of very nervous women, or those overworked; in general weakness with feebleness of the uterine functions; dysmenorrhea with deficient menstrual flow; uterine colic, lumbar and bearing down pains, it is efficient. Uterine congestion and chronic metritis, spasmodic dys-

menorrhea with excessive flow, malarial menorrhagia, uterine hemorrhage near the menopause, and anemic amenorrhea, are quite markedly influenced by viburnum. Muscular cramps during pregnancy are relieved by it. It is almost specific for cramps in the legs, occurring especially at night. It is the most reliable and prompt agent in the materia medica to check threatened abortion, if given before the membranes are broken.

In habitual abortion small doses should be administered a long time before the expected occurrence. Phares who introduced viburnum claimed that it would completely neutralize the effects of gossypium when the latter had been taken to cause abortion. In postpartum hemorrhage it is less effective than ergot or cinnamon. It assists in reducing the subinvoluted womb. Viburnum has been utilized for various neuroses, chorea, hysteria, hystero-epilepsy, petit mal, and paralysis agitans. It is said to be of value in sterility, spermatorrhea, ovarian irritation, and to control false pains and after-pains, almost equal to cimicifuga.

Howe employed black haw for dysmenorrhea, leucorrhea, pelvic discomforts, and chlorosis and the debility of the second climacteric. For the user of alcohol his cordial allayed the gnawing in the stomach and the pharyngeal irritation.

Specific indications.—Uterine irritability and hyperesthesia; threatened abortion; uterine colic, dysmenorrhea with deficient menses, severe lumbar and bearing down pains, cramp-like expulsive menstrual pains; intermittent painful contractions of the pelvic tissues; after-pains and false pains of pregnancy; obstinate hiccough.

Viburnin is one of the native plant-remedies that came like a revelation upon that part of the medical profession that had had little or no experience with the therapeutic treasures of our own land. Like veratrum and many others its introduction was under commercial influences, and yet it has won a large place in the practice of the profession. Its chief field is as a preventive of abortion, and here its influence has been well established. It cannot stop an abortion that has already occurred; nor should it be relied upon to the exclusion of accessory treatment, such as rest in bed, the avoidance of excitement and the quieting of apprehension, etc. The writer has employed viburnin and potassium bromide each in many cases, and considers the effects of the former better and more effective in every respect.

The dose of viburnin to stop a threatened abortion is from half

to one grain, repeated every half hour till effect. The recumbent position must be rigidly maintained; the patient being forbidden to rise even to evacuate the bowels or bladder. After the pains have stopped the remedy should be continued at longer intervals, and generally for months or till the end of pregnancy in doses of a grain three times a day.

XANTHOXYLIN.

Standard granule—Gr. 1-6, gm. .01.

Xanthoxylin is a concentration from Xanthoxylum fraxineum or Americanum, the prickly ash. An alkaloid has been found in the bark closely resembling berberine, and probably identical with it. This alkaloid has been identified in some xanthoxylum barks from South America. The other alkaloids and other principles in prickly ash have not been studied.

Felter and Lloyd find in prickly ash many virtues. It acts upon the secretions, the nervous and circulatory systems. It has remarkable powers as a sialagog, causes warmth in the stomach and promotes the flow of gastric and intestinal secretions. The bile and pancreatic action is also stimulated, the urine increased. The pulse is a little hastened, the skin acts abundantly. It is especially a stimulant of the sweat glands and the mucous secretions.

It is also emmenagog and carminative, and the berries antiseptic. It has been given for rheumatic complaints, with phytolacca; as an eliminant for debilitated patients; but the cases described are really myalgic—lumbago, torticollis, and muscular rheumatism. In toothache it is useful when there is dull pain from peridentitis. As an eliminant it is useful in syphilis and scrofula; in small and frequent doses. It has been employed as a local remedy in glottic paralysis; neuralgias and paretic conditions of the larynx and pharynx. This points to glosso-pharyngeal paralysis, but we doubt the efficacy of any remedy here. But in pharyngitis and post-nasal catarrhs with dry glazed mucous surfaces it probably does good. As a gastrointestinal tonic xanthoxylum is of use in atonic dyspepsia, gastric catarrh, costiveness, flatulence, jaundice from biliary catarrh or from malaria, spasm of the bowels, colic, cholera infantum, and cholera morbus. It is useful after dysenteries, and as a remedy for epidemic dysenteries. King used the berries for Asiatic cholera. He valued it highly in atonic diarrheas and typhoid conditions, and the tympanites of choleraic maladies. With

diuretics and tonics it has good repute in dropsies, malaria, and functional dysmenorrhea.

As a nerve stimulant it is given for all forms of nervous prostration, hemiplegia, locomotor ataxia, and all forms of vital depression. It relieves pains down the front of the thighs, after-pains with dorsal or sacral pains, neuralgic pains in anemic and delicate persons. By overcoming capillary stasis it sends to the surface the rashes of the eruptive fevers, especially if retrocedent.

Specific indications.—In small doses, for hypersecretion from debility and mucous relaxation; in large doses for nerve atony, capillary engorgement in exanthemata, sluggish circulation, tympanites, gastrointestinal torpor with deficient secretion; dry mucosa of mouth and fauces with glazed glossy surfaces, flatulent colic, Asiatic cholera, uterine cramps, and neuralgia; for painful bowel troubles the berries are preferred to the bark.

While the eclectics make a distinction between the uses of the bark and those of the berries, they give no data as to a difference in chemistry, nor do their accounts seem to show why there should be the difference in application. They term the bark stimulant, tonic, alterative and sialagog, while the berries are stimulant, carminative and antispasmodic, acting specially on mucous tissues. The bark is also said to be especially stimulant to the mucous surfaces. If there is any difference it would seem likely that the berries contain a carminative volatile oil in addition to the special stimulant of mucous secretion which is present in both parts of the plant. And to the latter the specific virtues of xanthoxylin are to be attributed. An agent that will stimulate the mucous secretions throughout the body, without nauseating or depressing like emetine or lobelin, is of considerable interest, and should receive numerous applications. It should be a good addition to prescriptions for habitual constipation when costiveness is a feature; and for the whole line of dry catarrhs. If the principle to which this effect is due can be isolated it might prove useful as a local application in nasal catarrhs of this description.

The dose of xanthoxylin is gr. 1-6 every one to two hours, until the effect is manifest, then less frequent. In chronic cases and for costiveness the dose may be placed at a grain four times a day.

YOHIMBINE.

Standard granule—Gr. 1-12, gm. .005.

Yohimbine is an alkaloid, $C_{23}H_{49}N_2O_4$. For rabbits the toxic dose is 0.011 intravenously and 0.053 subcutaneously, per kilogram

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of body-weight. In frogs it inhibits the heart-action, stopping it in diastole, and paralyzes respiration. The vascular tension is relaxed, the pulse-rate being unaffected. In warm-blooded animals small doses cause unrest, excitement and erections, and large doses cause violent spasms, followed by weakness. It paralyzes the motor centers but not the sensory. Oberwarth showed that the aphrodisiac effects are exerted upon the nerve centers. Bartholow suggests that it may prove useful in albuminuria, by substitution.

As reports accumulate upon the use of yohimbine as an aphrodisiac, its true action is becoming defined and its place in therapeutics fixed. The hydrochlorate is the form in which it is best prescribed, as this is comparatively stable, while pure yohimbine alkaloid is altered by the action of air and light.

Yohimbine is sharply differentiated in its effects. It produces hyperemia of the penis and testicles, in a short time after its exhibition. Repeated for a considerable period, no ill-effects were noted, and no degenerative change could be discovered on post-mortem. In locomotor ataxia and other organic disease no ill effect followed the use of this drug. In neurasthenia and nervous erethism marked benefit was obtained from it. Sometimes the benefit was immediate, but in other cases several weeks were required to obtain the good effects. Pains have been taken to exclude the influence of suggestion. Berger gave three times the usual dose, or .015 grams thrice daily, in some cases, before the desired effect was manifested. No ill effects followed these doses. He suggests that if the effect wears off the drug should be discontinued for a time; but those who have tested the drug most carefully do not agree with this.

In one case it seemed to stir up an old orchitis. In another, a lady normal anatomically but devoid of sexual desire or sensation, the only effect from yohimbine was prolongation of menstruation.

Yohimbine may be given by the stomach or hypodermically. For hypodermic use the hydrochlorate must be dissolved in boiling water. This solution will keep for a few weeks, and longer if a drop of chloroform is added. It is advised to give the tablets containing .005 each, three times a day, for six weeks or more, rather than to give larger doses.

It is quite evident from the accounts that yohimbine is strictly limited in aphrodisiac effect to the stimulation of erection and producing congestion of the testes; with, inferentially, an increase in their secretion, though this is not stated by any paper on this drug

we have yet read. But it is absolutely devoid of any power to arouse or increase sexual desire. It is not a drug to aid the seducer. When desire is present but erection imperfect or absent, yohimbine is the remedy indicated. This condition as caused by dilation of the penile veins, seems unknown to the Germans, and some of the failures recorded from yohimbine may be due to this condition. If so it is quite explicable that an agent relaxing vascular tension would not give relief.

Dr. J. Rutter Williamson records three cases in which he administered yohimbine with the desired result. One of his patients was a young man who, through nervousness and want of erectile power, had failed to consummate the marriage act during the entire two years of his wedded life.

Medication with strychnine, caffeine, damiana, cantharides and capsicum had proven fruitless. Three 10-milligramme doses of yohimbine brought about a restoration to normal function.

The two other cases were almost identical with the above-described one, except that the impotence had been of briefer duration and responded to doses of half the amount (5 milligrammes).

The high price at which yohimbine is held ($1.00 a grain) will limit its use for a time; but if it acquires a permanent place in therapeutics the price will undoubtedly subside.

ZINC CYANIDE.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

The cyanide of zinc represents therapeutically hydrocyanic acid and the preparations depending on this potent agent for their therapeutic value. Not one of these is trustworthy, uniform or safe in its applications. The writer has purchased the dilute acid, U. S. P., from the greatest manufacturers in the country and found it absolutely inert, in teaspoonful doses. He has tried to use potassium cyanide, bitter oil of almonds, etc., and the liquor known as noyau, the latter being the most satisfactory of all; but he had to give up the use of this agent as none of these proved sufficiently uniform in activity to be fairly safe. Zinc cyanide has proved all that could be asked in these respects, uniformly active and not subject to decomposition like the potassium salt.

Zinc cyanide is odorless and tasteless, insoluble in water and in alcohol, soluble in caustic alkalies and in ammonia. Strong mineral acids decompose it, setting free the hydrocyanic acid.

Henning employed this salt as a substitute for hydrocyanic acid, and found it satisfactory. It also exerted a vermifuge effect. In the nervous affection termed cramp of the stomach he gave gr. ¼ with magnesia and cinnamon every four hours. It has been recommended in chorea, epilepsy, and other neuroses. In neuralgia, especially of the fifth nerve, it appears to be of value; and in neuroses of the heart with arrhythmia, pain and palpitation, doses of gr. ¼ every hour or two have been advised.

The double cyanide of zinc and potassium has the advantage of being freely soluble in water. The dose is the same as of the preceding.

In the stomach, however, zinc cyanide is decomposed by the acid of the gastric juice, setting free the hydrocyanic acid. Given in too large doses the chloride of zinc formed will irritate the stomach. The effects of glonoin so closely resemble those of the cyanides that they should be considered synergistic.

Hydrocyanic acid occurs in the seeds of the apple, cherry, prune, plum, peach and apricot; and especially in the bitter almond.

Kirschwasser and maraschino, as well as noyau, contain this acid. Laurel water and wild cherry contain the acid in very small quantities. The action of the acid and of its single salts is identical, but the double cyanides are mostly inert—or at least harmless.

Physiologic Action.—Hydrocyanic acid is a protoplasmic poison, first stimulating and then paralyzing the central nervous system. Cushny places the fatal dose for man at gr. 1—1½ of the pure acid. It acts with the greatest rapidity. After very large doses there may be no symptoms—the animal falls with a slight convulsion or a scream, and death ensues in a few moments from paralysis of the heart and respiration. In small doses it has a bitter acrid burning taste, with salivation, followed by numbness in the mouth and throat. Warmth in the stomach is followed by nausea, vomiting, mental confusion, headache, dyspnea, slow pulse, and general muscular weakness. The pupils dilate widely and the eyeballs protrude. Unconsciousness follows, then convulsions, passing into paralysis, the bladder and bowels opening involuntarily. Respiration weakens and ceases, the heart continuing to beat for some time longer. The action seems to develop in the medulla and basal parts of the brain rather than in the cortex. Some local anesthesia is caused.

Small doses quicken and deepen respiration. The pulse is slowed by stimulation of inhibition, and the pressure rises from vasoconstrictor central stimulation. Paralysis of both follows from in-

creased doses, but as the cardiac muscles is directly affected the pulse remains slow. The movements of the stomach are lessened; the temperature rises a little after small doses, falls fast after toxic doses (Cushny).

Geppert found that prussic acid lessened the absorption of oxygen by the tissues, and less carbonic acid was excreted. Oxyhemoglobin not being reduced in the capillaries, the venous blood was as red as the arterial. The acid is rapidly decomposed in the blood, so that the symptoms are of brief duration. The acid is changed to sulphocyanides in the tissues, and is partly excreted through the kidneys in that form. Part undergoes other changes, whose nature is unknown.

Therapeutics.—Zinc cyanide may be prescribed to meet symptoms resulting from increased sensibility of the cerebrospinal system, and excitement of the heart. It may soothe intense pains, calm exalted sensibility, and prevent reflex spasms. In laryngitis and acute respiratory inflammations Van Renterghem associates it with aconitine, digitalin and strychnine; in spasmodic and painful affections of the air passages and abdominal organs, in convulsive cough and that of phthisis, cardialgia, colic and vomiting; and in the chronic nervous maladies, epilepsy, chorea, hypochondria and hysteria, he finds the field for this agent. In organic diseases of the heart and great vessels it calms over-action; applied locally it relieves pain and itching.

In acute cases it is wise to give cautiously at first, a granule gr. 1-67 every hour or two, until the susceptibility is ascertained, of children. But to adults this dose may be given every quarter-hour, or doubled. In cardialgias we may add strychnine or hyoscyamine; after having emptied the bowels; in heart cases join to digitalin, the arsenates, and care for the doses, which may be a granule or two four or five times a day; in the neuroses veratrine, cicutine, arsenates, atropine, strychnine, bromides, or other remedies as may be indicated.

It is always better to use the smaller dose, and multiply the doses, as the drug is quickly decomposed or eliminated; and thus the irritation of the stomach is avoided. In many of its uses glonoin has perhaps replaced the cyanides, but the latter relieves irritative cough and nausea, which the former does not do. In the cough of phthisis especially, the use of zinc cyanide enables us to dispense with opiates for a long time. Here the action of the zinc on the stomach is usually beneficial as it acts as an antiseptic, and this action is needed.

ZINC OXIDE.

Standard granule—Gr. 1-6, gm. .01.

Zinc oxide being insoluble is less apt to irritate the stomach than the chloride, or even the sulphate. In small doses the oxide soothes irritation of the stomach, allays nausea, checks diarrhea, and tends to restore a chronically catarrhal mucous membrane to its normal state. A specialist of very great experience stated to the writer that he considered the curative effects of zinc oxide superior to those of all the other metallic salts in use.

Zinc is excreted in the bile and the urine, and by the walls of the stomach and bowels. Its continued action or exposure to its fumes as in those working with it, results in a condition of chronic poisoning, characterized by malaise, weakness, vague pains, rigors, fast pulse, cough, soreness in the thorax, and headache. Profuse sweating occurs, followed by sleep. These attacks recur frequently.

Therapeutics.—Zinc oxide has been given for epilepsy, chorea, hysteria and a variety of neuroses, with considerable benefit. It is one of the most reliable remedies for gastric ulcer, and especially as following the oxide of silver when the latter must be discontinued to avoid argyria. It has been advised in whooping-cough, catalepsy, neuralgia, and gastrodynia. It is decidedly useful in the gastric and nervous symptoms of drunkards, relieving the nausea, tremors, vertigo, insomnia, tinnitus and hallucinations. Taken during the evening it prevents night-sweats. Felter and Lloyd give the following specific indications: Nervous dyspepsia, broad tongue and full abdomen, gastric ulcer, chronic gastritis with free mucous secretion; night-sweats.

The book doses of zinc oxide are too large. It is best given in doses of gr. 1-6 to 1 every hour or two, stopping when there is the first sign of irritation. It is the least irritant, most effective and safest preparation of zinc for the effects of that metal.

ZINC PHOSPHIDE.

Standard granules—Gr. 1-67, gm. .001; gr. 1-6, gm. .01.

The action of zinc phosphide being identical with that of phosphorus, we will consider here the latter element, looking upon the salt named as the best available means of securing the therapeutic effects of phosphorus.

Physiologic and Toxic Actions.—Large doses of phosphorus have been swallowed without harm resulting, because its insolubility pre-

vents its absorption. But if absorbed it causes toxic symptoms in very small doses. Two grains have proved fatal to man. Phosphorus vapor is, absorbed by the lungs and causes poisoning in factories. It is absorbed and exerts its effects as phosphorus itself.

No effect is manifested from toxic doses for some hours; when pain and uneasiness is felt in the stomach, nausea, eructations of garlicky odor, and vomiting of matters with the same odor; which are phosphorescent. There may be vomiting of bile, and diarrhea. These symptoms may last some days or cease after the stomach has been washed out. But they are apt to recur, with jaundice, pain extending to the liver, and over the abdomen. The vomitus may be bloody. There is pronounced debility, pulse weak, liver enlarged, urine albuminous, ecchymoses and hemorrhages from the mucosa, collapse and coma. Convulsions and delirium may precede death. Death may occur at any stage. Recovery may occur even from the second stage.

Exposure to the fumes of phosphorus causes necrosis of the lower jaw. It is apt to start with a carious tooth. It may also cause chronic poisoning, with cachexia, jaundice, anemia and albuminuria; followed by chronic enteritis, diarrhea, bronchitis, and fragility of the bones.

Fat globules appear in the cells of the liver, kidney, glands of the stomach and bowels, and the muscular fibers of the heart, stomach, intestine, small arteries and sometimes in the striated muscles. Cirrhosis appears in the stomach, liver and kidneys.

When doses too small to set up the above symptoms are taken, changes occur in the growing bones. Dense bone is deposited in cartilage instead of cancellous, and formed calcellous bone is absorbed. The medullary cavity is thus enlarged.

When death occurs early in poisoning from phosphorus it is due to a direct action upon the cardiac muscle. The blood does not clot as readily as usual. Small doses increase the red cells, but not the hemoglobin, and lessen the number of white cells. Fatty degeneration of the epithelium explains the gastrointestinal symptoms. The enlargement of the liver is due to fat. The renal epithelium becomes fatty, and fatty casts and globules appear in the urine, with blood and hemoglobin. At first the excretion of urine is increased, later it becomes scanty and may cease. The excretion of nitrogen is lessened by the vomiting but later increases, even if fasting. Ammonia increases much more than urea. Sarcolactic acid is found in large amount; the uric acid is little altered, the extractives in-

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creased; tyrosin, leucin, albumin and peptone appear. Harnack found some substances not peptones though closely related. The chlorides are much reduced, the phosphates increased, as are the sulphates, and bile may be present. All these alterations point to a grave derangement of metabolism. The alkalinity of the blood is reduced. The glycogen of the liver is remarkably reduced. The two factors conclusively shown to exist in phosphorus poisoning are fatty degeneration and lessened oxidation in the tissues.

Phosphorus has little effect on microörganisms, or on the digestive ferments. Phosphorus is partly oxidized in the body, partly excreted by the lungs, and partly by the kidneys in various combinations.

Phosphorus poisoning calls first for thorough evacuation of the stomach, as the poison is absorbed slowly. Oil of turpentine forms with phosphorus compounds not very toxic, and may aid in its oxidation; hence is used as an antidote. The benefits are doubtful. Sulphate of copper is also used as an emetic and as forming an insoluble compound. In the secondary stage alkalies are given to neutralize the excess of acid. The necrosis is treated surgically.

Therapeutics.—Phosphorus has proved useful in rickets and in osteomalacia, This has led to its use for caries and necrosis, and for ununited fractures. Phosphorus has been largely employed as a remedy for nervous debility and exhaustion, neurasthenia, insomnia, the results of over mental work; also for the more serious consequences of such excesses, softening of the brain, or paresis, with very little demonstrable benefit. As a general tonic its use betrays ignorance or culpable rashness on the part of the prescriber. It is too dangerous a drug to be employed as a substitute for iron, quinine and the hypophosphites. In many neurotic maladies it is given with the hope rather than the expectation of benefit; such as all forms of paralysis, locomotor ataxia, and the whole line of convulsive affections.

In neuralgia its use is better based: In dealing with pure neuroses there is something in taking the malady by storm, as it were; and a course of treatment instituted vigorously at the beginning will succeed in making a favorable impression when the same remedies given timidly till the system has become accustomed to them will fail. To such a case as an inveterate neuralgia give zinc phosphide gr. 1-6, and the arsenate of strychnine gr. 1-50, the arsenates of iron and quinine gr. 1-6 each, with atropine valerianate gr. 1-134; all together every four hours, and within two days the force

of the malady will be broken, and milder doses will complete the cure. When any neurosis is traceable to sexual, alcoholic or other excesses, phosphorus may prove beneficial. Senile degenerations may be temporarily benefited by this potent agent, but in impotence the writer has never seen any but ill results. There may be a momentary stimulation of the sexual function but it is followed by quicker exhaustion. Phosphorus will not make an old man young; but that is exactly what we are asked to do with it.

It has been advised in melancholy, dementia, various forms of mental failure and aberrations, but not even occasional success has resulted from the writer's use of the drug here. Scudder advised it through the whole line of chronic and atonic vesical and seminal affections, but its value has not been demonstrated.

In the low stages of fevers, typhoid, pneumonia and malaria, phosphorus has been recommended as a stimulant; but just now strychnine is preferred. Still there may be a place here for phosphorus. The use of modern methods in these and other fevers has rendered such emergencies almost obsolete.

The use of phosphorus for fatty degeneration of the liver, and for malignant jaundice is no more to be condemned as "homeopathic" than its undoubted use in rickets and osteomalacia.

Felter and Lloyd give as specific indications: Nervous exhaustion, atony, vesical and prostatic irritation with mucoid discharges; fullness and dragging in the perineum; weariness in legs; mucoid rectal discharges; low muttering delirium in low fevers with involuntary discharges; chronic bronchial and pulmonary affections with heat, dryness, hacking cough, and difficult expectoration of mucopurulent or sanguineous sputa; rusty sputa; pulmonary hyperemia; pinkish face with staring eyes; expressionless pasty tongue; insufficiency of the internal recti of the eye; sexual debility.

The writer has employed zinc phosphide for many years in every case of herpes zoster applying for treatment, and has never found a case that resisted the remedy. He gives gr. 1-6 an hour before each meal to an adult, and within two days the attack is under control. As this malady is due to degeneration of the roots of the affected nerves, there is reason for the use of the same remedy in other maladies dependent on that condition; and in this also we have not been disappointed. Localized neuroses in general come under this description and for them we would urge a trial of this remedy.

The full adult dose of zinc phosphide we would place at gr. 1-6 four times a day, given as far as possible from the meals to avoid

the development of phosphureted hydrogen. The difficulties encountered in administering phosphorus are so numerous that it seems advisable to go over the whole list for which it has been advised with the more manageable and safer, yet efficient, zinc phosphide.

ZINC SULPHOCARBOLATE.

Standard granules and tablets—Gr. 1-6, gm. .01; gr. 1, gm. .06; gr. 2, gm. .15; gr. 5, gm. .3.

The sulphocarbolates were introduced many years ago, as intestinal disinfectants, but fell into disuse before they were fairly tried. Two arguments were adduced against them—that it was impossible to render the alimentary canal free from germs; and that these agents being soluble they were absorbed from the stomach and did not get down to the intestine where their effects were most desired.

In regard to the first objection, it is well to ask whether it is really necessary to destroy every living inhabitant of the alimentary canal in order to do any good? There are many ways by which the great benefits derived from the intestinal antiseptics may be explained. They may destroy a portion of the microörganisms; or prevent their multiplication; or neutralize the toxins produced by them; or prevent their inroads upon the mucous tissues; or render the tissues more resistant; or interfere with the attacks of the ordinary putrefactive bacteria that follow in the wake of specific organisms like the typhoid bacilli and break down the weakened structures. In fact, we do not know so much of the life history and the operations of the various bacteria that we can predicate on the usefulness of such an agent simply because it does not do some one thing that we have set up arbitrarily as a test of its value. The only test worth serious consideration is that of clinical trial; and the question is not whether the remedy does this or that, but how we can best explain the phenomena which follow its administration. This question has been wholly ignored by the opponents of the practice of intestinal antisepsis.

An insoluble agent is inert until it is in solution. Then it is no longer insoluble. Many attempts have been made to devise means of getting remedies past the stomach to be dissolved only when they reach the small bowel, but the solvent powers of the gastric juice are exerted even over keratin. This is an *a priori* consideration—we have as yet seen no attempt at demonstration of the assertion that agents soluble in the stomach will not disinfect the intestine. We

are therefore again reduced to the necessity of relying on the phenomena observed clinically, and here we find that the administration of the sulphocarbolates in efficient doses is invariably followed by a cessation of the fetid odor of the stools. Why this should be, if the soluble antiseptics have no action in the intestine, we leave those who believe that dogma to explain.

The writer has possibly administered more of the sulphocarbolate of zinc than any other man living; and he has not observed any effects from it except those exerted in the alimentary canal. If impure, or given in too large doses or too concentrated form, it irritates the stomach and may even cause vomiting. But the chemically pure salt has been given many times in doses of ten grains each, and up to two drams in 24 hours, without any such effects. There are conditions of the stomach when many agents not ordinarily irritant will provoke nausea or cause soreness. Sometimes a granule of veratrine in half a glass of water will give rise to a sense of warmth or tenderness that will outline the stomach accurately. A five-grain tablet of potassium bromide swallowed whole caused a brother physician to roll on the floor in agony; and yet this is not considered specially irritant. It is wise to give the sulphocarbolates in solution or trituration with abundance of diluent.

Therapeutics.—Typhoid Fever. In all cases it is best to first completely empty the bowels. It is useless to try to disinfect the intestine if there is the mechanical obstacle of masses of feces into which the disinfectant cannot penetrate. Give a dose or two of calomel and then a saline laxative; and when the bowels have been cleared out well begin with the zinc sulphocarbolate, giving from 2½ to 5 grains every two hours until the stools are devoid of all unpleasant odor. After this half the above doses, or even less, will suffice to keep the stools deodorized, and this will disinfect them sufficiently to secure all the advantages of the method. The gastric and intestinal symptoms subside as the stools become odorless; the fever drops a degree or more, the aching, delirium and other nervous phenomena are alleviated, and the whole aspect of the case has changed for the better. If employed early enough many cases are shortened or aborted, so that the physician who begins to employ this method soon has trouble with his diagnoses.

Cholera Infantum. In all cases when the child's stools begin to be offensive treatment analogous to that of typhoid fever should be instituted. Give calomel in very small doses, or rhubarb, and empty the alimentary canal; then begin with zinc sulphocar-

bolate, gr. 1-6 to 2 every hour according to the gravity of the case, and continue until the stools are disinfected. If choleraic symptoms are present begin at once with the zinc. It is best given with bismuth, saccharated and pepsin if there is nausea or vomiting —enough of each to well dilute the zinc. Half a grain of the latter with two to five grains of each of the other agents is a fair average formula.

Fevers: In all fevers, essential and symptomatic, the above method of emptying and disinfecting the bowels, will result in an amelioration of the symptoms amounting to thirty or forty per cent. There is no febrile disease in which a large part of the symptoms, the discomfort and danger, are not due to absorption of toxic matters from the alimentary canal—at least we are sure our readers will admit that such absorption cannot be of any advantage to the patient. This seems to have been better comprehended by the physicians of half a century ago than it is today; excepting in the malarial sections, where the necessity of having the bowels clear and clean is generally admitted and acted upon.

Phthisis: It was a lesson the writer has never forgotten, when he first applied to a consumptive the principle of clearing out the bowel and disinfecting it. The same fall in the fever occurred as in typhoid fever, the other symptoms were ameliorated, and the appetite, hitherto wanting, became voracious. This one measure produced in the patient more improvement than the most ingeniously devised treatment had previously accomplished.

In fermentive dyspepsias, and all cases where the stools are malodorous, this agent will prove promptly effective. It is an admirable remedy for children, who very frequently need something of the sort. While clearing out the bowels will do good, it needs but a trial to convince anyone of the greater benefit coming from the disinfection. The alkaline syrup of rhubarb makes an excellent excipient for the sulphocarbolates.

When there is acidity, or when the zinc proves irritating even if given properly extended, the sulphocarbolate of soda is useful. It is not as antiseptic as the zinc, and should be given in double the doses recommended for the latter.

In dealing with scrofulous children, in the peculiar diarrhea of rickets, and for consumptives who are having night-sweats, the sulphocarbolate of lime may be used. It is about the same strength as the soda salt. In fact, whenever the reconstructive effects of

lime are indicated, this is the sulphocarbolate of choice. It may be given with the hypophosphite or other salts of lime.

ZINC VALERIANATE.

Standard granule—Gr. 1-6, gm. .01.

Zinc valerianate presents one of the best agents from which to secure the remedial values of valerian. The dose is small, the acid active, and through the whole line of its action the zinc favors the effects of the valerian.

Felter and Lloyd mention this agent as an antispasmodic, used in neuralgias, especially spinal and of the fifth nerve; also in chorea, epilepsy, neuralgic and nervous headaches, hysteria, sciatica, ovaralgia, and angina pectoris. The specific indications are: Colic, reflex from ovarian or uterine disease, headache, paleness, dizziness, sleeplessness, anemia.

Many cases of insomnia are over-treated. Due to nervousness, they are quickly relieved by a few granules of zinc valerianate. Nervous unrest, worry, irritability, crossness, fidgets, even well-founded grief such as that from the death of a friend, are relieved by valerian. Or at least it enables the afflicted one to bear the grief with equanimity, to hold the emotions under decorous control. Probably all forms of disturbed nervous and emotional equilibrium are tranquilized by this remedy.

The writer has found the insomnia of typhoid fever yield to zinc valerianate in very moderate doses. Even that occurring during the withdrawal of morphine from a habitue is notably benefited by valerian. Sexual excitement is regulated by this agent, controlled but not weakened, and for nymphomania, satyriasis, spermatorrhea, and the erethism so common after abuse of the sexual functions there is no better agent for restoring the strength and the control at the same time. This remedy is as useful for one sex as for the other. If the patient has been in the habit of taking the powerful stimulants or hypnotics much larger doses of the valerian preparations are necessary.

The dose of zinc valerianate for an adult is gr. 1-6 to 1-2 repeated every quarter-hour till effect. Overdoses simply irritate through the zinc.

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In gastric fermentation quinine salicylate, gr. 1-6 every half to one hour, is quite effective.

SANGUINARINE.

Standard granule—Gr. 1-67, gm. .001.

Sanguinarine is an alkaloid from bloodroot, Sanguinaria Canadensis. It has also been found in Chelidonium majus, and in Eschscholtzia Californica. Sanguinaria also contains chelerythrine, protopine and gamma-homochelidonine. The only form in which sanguinarine is used in medicine is the nitrate.

Small doses of sanguinarine increase the appetite and the digestion, strengthen the heart and slow the pulse, and excite the respiratory secretion. Larger doses cause a sense of warmth in the stomach, nausea, sedate the heart and slow the pulse, increase the perspiration, expectoration, urine and bile, and the menses. Still larger doses cause violent vomiting, even catharsis, vertigo, troubled vision and great prostration. The saliva is increased. Violent gastrointestinal irritation ensues, with burning pain, relaxation, and the symptoms of collapse, cold clammy skin, dilated pupils, great thirst and anxiety, the spinal reflexes depressed, and death from paralysis of the respiratory and cardiac centers.

Sanguinarine is employed by the eclectics as an emetic, in conjunction with lobelia, in various febrile complaints when it is desired to thoroughly cleanse the stomach and arouse to activity the liver and glands in general. Acting gently on the liver it is used in chronic hepatitis; in small doses for atonic dyspepsia, gastric and duodenal catarrh and jaundice; sick headaches with torpid liver; for rheumatism, dysentery and scrofula with bad circulation; for anemic amenorrhea and the dysmenorrhea of debility, with chilliness and headache; hysteria; hemoptysis vicarious in character; genital debility of men; syphilides, tinea, hypertrophic rhinitis (Felter and Lloyd).

The most important field for sanguinarine is in pulmonary affections. It is a stimulant expectorant, and especially indicated in the very aged or very young, when the sensibility of the respiratory mucosa is low and the patient does not feel the need of coughing to rid the tract of accumulating secretions. In this particular condition sanguinarine has no equal. It arouses the sensibility and makes the patient cough harder until the secretion is ejected and the danger past. Great care must be taken not to exceed the stimulant dose and

get the sedation and nausea of overdoses. The indication for this remedy may arise in pneumonia, bronchitis, phthisis, and especially in capillary bronchitis.

Another indication for sanguinarine is found in acute respiratory catarrhs. The existence of disease in these tissues predicates a condition of low vitality there—else the tissues would have been able to resist the attack of disease-producing agencies and throw off the malady. Hence the indication for a special inciter of the vitality of these tissues, such as we find in sanguinarine. How far this principle of therapeutics can be carried is uncertain. In acute pharyngitis the application of a strong mixture of hydrochloric acid, potassium chlorate and tincture of iron, in which free chlorine is present, has frequently aborted the attack when applied early. The action may have been antiseptic, stimulant, vital incitant, or simply astringent—and we incline to the latter view. If sanguinarine exerts the action suggested, it does so when given in doses strictly physiologic, that is, just short of those arousing notable symptoms.

Felter and Lloyd further recommend this agent in acute and chronic nasal catarrh, humid asthma, whooping-cough, membranous croup, and scarlatinal sore throat.

Specific Indications.—Tickling or irritation of the throat, with cough, burning or irritation in fauces, larynx, pharynx or nose, with red surface and thin, acrid, burning or smarting discharge, dryness of nasopharynx or throat and sharp lancinating pain, and a feeling as if the walls of the throat rubbed against each other; poststernal constriction, uneasiness at suprasternal notch with difficulty in breathing; uneasiness and burning in stomach with nervousness.

The dose of sanguinarine nitrate as a stimulant expectorant is gr. 1-67 to 1-22 every hour till effect, relief or slight nausea. For anemic amenorrhea give gr. 1-22 to 1-12 before meals and at bedtime, during the intermenstrual period, with iron arsenate; adding apiol during the menstrual week.

SANTONIN.

Standard granule—Gr. 1-6, gm. .01.

Santonin is a glucoside from German wormseed, Artemisia maritima.

It is very insoluble in water but rendered soluble by alkalies with which it unites to form santoninates. It is slightly soluble in the stomach but most of it passes into the small intestine where it exerts

its influence. Some of it is absorbed into the circulation, causing a peculiar disorder of vision, things appearing to the patient of a yellowish green. The urine assumes the same color. If very large doses are taken the darker colors become invisible, blue seems green, and visual hallucinations may occur. The senses of taste, smell, and rarely hearing, may be deranged. Very large doses cause twitching of the head muscles, rolling of the eyes, grinding teeth, followed by epileptiform convulsions; with contractions of the muscles during the intervals. Death during the convulsions is due to asphyxia. Confusion, nausea and vomiting may occur from ordinary doses, or aphasia. The convulsions are attributed to stimulation of the cerebral cortex, the interval contractions to increased activity of the parts lying between the cerebral peduncles and the medulla (Cushny). Large doses also affect the cord. Santonin lowers the temperature in most animals (Harnack). It is partly oxidized in the tissues and is excreted in the urine and feces in several forms. Two days are required for the elimination of an ordinary dose. The quantity of urine and frequency of micturition are increased. Urticaria has appeared after its prolonged administration; and even from one three-grain dose.

Therapeutics.—Santonin is the standard remedy for round worms. Solutions do not kill these worms outside of the body, and its remedial action is obscure. Von Schroeder suggests that it renders the intestine an unpleasant abiding place for them—which is very little explanation. Precise observations made in a London hospital showed that santonin did not entirely remove the parasites, since their eggs continued to appear in the stools after full treatment with it. Against thread and tape worms santonin is useless.

The dose of santonin for a child three years old is a grain three times a day. It is usual to combine small doses of calomel—gr. ¼—with it. Lewin advises giving santonin in castor oil to hinder absorption from the stomach. Empty the bowels first by suitable laxatives, then give the day's dose of santonin, and follow in four hours with a smart laxative. Otherwise the worms may be digested and the efficacy of the treatment be uncertain.

In poisoning by santonin, empty the stomach and bowels promptly, control the convulsions by chloroform or chloral, and sustain the powers as failure threatens.

The notable effect of santonin on the nerve centers has led to its employment in other maladies. Lydston gives it for epilepsy, instead of the bromides. It is a good antispasmodic for children,

says Shoemaker; but we are well supplied with approved agents in this respect. Lydston begins with doses of gr. 2—5, for adults, and pushes it to tolerance. Saturation is denoted by the yellow urine, xanthopsia and vesical irritability.

Negro found santonin relieve the painful crises of ataxia; giving it up to gr. 22 daily.

Santonin has been given for color blindness, with some benefit in noncongenital cases. In other ocular maladies it has not succeeded. Nocturnal enuresis sometimes yields to it (Shoemaker). In anemic amenorrhea Whitehead gave santonin gr. 10 at bedtime repeated once, with benefit; and Masterman found this relieve uterine colic dependent on suppression of the menses.

SCILLITIN.

Standard granule—Gr. 1-67, gm. .001.

Scillitin is a glucoside from squill, Scilla maritima.

From squill Merck obtained three principles, scillipicrin, scillitoxin and scillin. Von Jarmerstedt and Kurtz obtained scillain, an amorphous bitter principle, soluble in water or in alcohol.

Vogel describes scillitin as a solid diaphanous mass, colorless, of resinous fracture, pulverizable, at first bitter, then sweetish, very hygroscopic, easily soluble in water, rectified spirit or acetic acid.

Tilloy separated from this body a purer scillitin and a noncrystallizable sugar. This body does not dissolve readily in water but freely in alcohol. Landerer and Marais believed they had discovered an alkaloid, scillitine, which is probably Merck's scillitoxin. Jarmerstedt's scillain is pronounced by Van Renterghem a pure scillitoxin. Of this a dose of 1-10 milligram kills a frog, 2 milligrams a cat. It shows close analogies with digitalin.

Fronmueller pronounced scillipicrin a diuretic which had no superior. Out of 17 cases of grave oliguria treated with it 15 were successful. It was not suitable for hypodermic use, the irritation being too great.

Von Schroff found the action of scillitin bearing upon the ganglionic nervous system and the secretory organs, especially the kidneys and the respiratory mucosa. In massive doses it occasioned nephritis and gastroenteritis, with parenchymatous pulmonary hemorrhages. Lethal doses killed by ganglionic paralysis, especially of the heart. He placed this body with colchicine and helleborein.

Gubler found scillitin toxic in doses of gr. 5-6, smaller doses causing acute gastroenteritis. It acted as a violent emeto-cathartic.

Narcotism followed, and death from heart paralysis. Applied endermically it was quicker, and the effects almost purely narcotic. Koenig after long experimentation on animals obtained no toxic phenomena.

Huesemann concluded that squill in medicinal doses causes slowing of the pulse with a rise in arterial tension; lasting some hours; light laxative action with liquid stools; long-continued use disordered the digestion; no narcotic phenomena were noticed. Excessive doses caused nausea, vomiting, diarrhea, slowed the pulse to 40, prostration, narcosis, and convulsions. One dose of 22½ grains of squill killed a man. Toxic doses suppress the diuresis and cause hematuria.

In medicinal doses squill reduces the frequency of the heart and increases its force, as well as the vascular pressure, increases the excretion of urine, and of the respiratory mucus. Toxic doses cause gastrointestinal inflammation, and kill by paralyzing the heart. The active principle which most closely represents the plant is scillain (Van Renterghem).

Therapeutics.—Scillitin may be employed as a substitute for digitalin, over which it has some advantages—not cumulative, etc. It should not be given in irritative conditions of the kidneys, or of the stomach or bowels; even though Huesemann claimed that clinical experience did not warrant this contraindication. There are other remedies that will do the work, in case of doubt.

Scillitin has been employed in various dropsies, in combination with digitalin and calomel; and this has proved more effective than either agent separately. Give scillitin gr. 1-67, digitalin gr. 1-67, and calomel gr. 1-12, together, every two hours till the result is satisfactory. In advanced cardiac dropsies when other diuretics have lost their effects this combination will frequently prove surprisingly effective. But the principles of treatment of this malady comprise something far beyond the simple abstraction of a few ounces of serum from the body. If the dry diet, and elimination, are not comprehended, the results of any treatment will be but transitory.

Scillitin resembles sanguinarine in its power of increasing the sensibility of the respiratory mucosa, and making the patient cough harder. This and a slight increase of the mucous secretion comprise its effects in respiratory affections, and the combination of squill with sedatives like paregoric is one of the curious instances of incompatible mixtures common in the old polypharmacy. No case can be imagined that requires the two in the same case at the same time.

The dose of scillitin is gr. 1-67 every hour or two; or five granules every four hours, as a maximum.

SCUTELLARIN.

Standard granule—Gr. 1-6, gm. .01.

Scutellarin is a concentration from skullcap, Scutellaria lateriflora. It contains a glucoside obtained in acicular crystals by Myers.

Felter and Lloyd say that scutellaria is tonic, nervine and antispasmodic; which has proved especially useful in chorea, convulsions, tremors, intermittent fever, neuralgia, and many nervous affections. In delirium tremens it induces sleep. It is useful for the nervousness of teething children. In nervous excitability and restlessness or wakefulness, with or after acute or chronic maladies, from physical or mental overwork, or other causes, it is useful. It influences the cerebrospinal centers, controlling nervous irritation; hence its value in functional cardiac affections.

Specific Indications.—Nervousness, in or after diseases; or from exhaustion; or teething; nervousness manifested by muscular action; tremors, subsultus, hysteria, inability to control muscles; functional cardiac disorders purely nervous, with intermittent pulse.

Ellingwood recommends scutellaria for paralysis agitans, and with cimicifuga in chorea; for insomnia from restlessness or excitability, and in prolonged fevers; it promotes sleep and stimulates the kidneys and skin to increased activity. The soothing effect continues after the remedy has been discontinued.

The writer has employed scutellarin to some extent, and finds it closely resembling cypripedin and valerian in effects. It is a mild, comforting nervous sedative, relieving nervous restlessness as well as the bromides and without their destructive effects upon the digestion and the vitality. In fact, this remedy should be classed as a nerve strengthener instead of a sedative. Subduing nervous irritability is not sedation but rather lifting the function up to a plane where it can act normally.

The dose of scutellarin is from one to five grains, every hour till effect; the small dose is usually sufficient. Many times such a remedy is all that is sufficient, and strychnine is not needed.

SENECIN.

Standard granule—Gr. 1-6, gm. .01.

Senecin is a concentration from Senecio Jacoboea, or ragwort. Two alkaloids have been found in this plant, senecine and

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senecionine. Bunch found that it caused a rise in the vascular pressure, with constriction of the peripheral blood-vessels and those of the intestines. Under large doses the general pressure fell, the intestinal vessels dilated, and the contractions of the intestinal coats were inhibited. These effects were obtained from the alcoholic extract. The watery extract caused a fall of vascular pressure and cardiac inhibition (Shoemaker).

Senecin has been mainly employed as a regulator of menstruation; one of the popular titles of the plant being the Female Regulator. Delache and Heim found the solid extract act well, giving gr. 36 daily. Bardet and Bolognesis used it in 20 cases of amenorrhea and dysmenorrhea, and found it had the constant property of inducing the menstrual flow and relieving the pain. Murrell speaks highly of this agent as an emmenagog, first treating the anemia and then giving senecin. One of the names of this plant is "old man," and it has been advised for impotence, with doubtful benefits.

Felter and Lloyd consider senecio of value in female disorders, relieving irritation and strengthening function; promoting menstruation when there is no structural lesion; in dysmenorrhea, sterility and chlorosis; in menorrhagia given during the intermenstrual interval and at ovulation; for tenesmic and painful micturition of either sex; leucorrhea with weakness of the vaginal walls allowing uterine displacement, with engorgement; male genital disorders with pelvic weight and full, tardy or difficult urination, and dragging sensation in the testicles; for tardy digestion from congested or relaxed gastric mucosa; capillary hemorrhages, hematuria, and bloody albuminuria; pulmonary hemorrhages; an excellent diuretic in gravel, etc., specific in strangury; dysentery.

Specific Indications.—Atony of reproductive organs with impaired function; uterine enlargement, uterine or cervical leucorrhea; difficult tenesmic urination; dragging in testicles; perineal weight and fullness.

Ellingwood says senecin works best in a general hyperemic irritable and atonic condition of the pelvic organs; the results are not immediate; in engorged conditions of the male sexual organs, impotence, an active diuretic; of value in gonorrhea and gleet, and prostatorrhea, sexual irritability of the male; overcomes conditions that cause food to lie heavy on the stomach; acts in harmony with viburnum, helonias, aralia, mitchella, etc.

In the trials the writer has made of senecin he has had no re-

sults whatever, from doses up to five grains a day. It is evidently requisite that much larger doses should be given, and as it does not act very quickly, the remedy should be continued for a month or more.

SODIUM SUCCINATE.

Standard tablet—Gr. v, gm. .33.

Some 20 years ago the writer's attention was directed to sodium succinate as a remedy for gall-stones. He commenced its use for that malady, giving five grains before each meal and at bedtime, and continuing its administration for a year. The paroxysms of the disease became gradually less frequent and less severe, until within the period named they ceased entirely.

This experience has been repeated with every case seen by the writer since, and in all except two cases the above result has been attained. In one of these, a young woman with the intermittent febrile form, simulating malaria, the remedy was used intermittently and the test was not a fair one. In the other a physician came to the writer with the morphine habit from 25 years of this malady, and within a week the gall-bladder suppurated and surgical intervention was imperatively demanded. After years of suffering and many operations he is well. With these exceptions every case has recovered under the use of the succinate.

What does it do? We do not know. We have never had the opportunity to perform an autopsy on a man who had been taking the drug. Does it dissolve the calculi? We think not. Possibly it does. Does it subdue the catarrhal affection of the biliary passages and the duodenum? We think it does. It may act as an antiseptic or germicide, or in some other manner. All we know about it is comprised in the statement herein given. No theory is advanced; the practically unvarying success of twenty years is a phenomenon for the consideration and testing of our readers. As to the diagnosis, there have been a number of cases which had been diagnosed as gall-stones by the first surgeons of the country, and the knife presented as the only treatment worth consideration—even the date set for operation; and yet these cases are among those which recovered on the succinate treatment.

The succinate is not a remedy for the paroxysm.

Dr. W. H. Nunn writes that he attended a man with biliary calculi, and gave him the sodium succinate treatment. The man

never had another paroxysm. Many cases have been reported to the writer where others have obtained results fully equal to our own.

SPARTEINE.

Standard granules—Sulphate gr. 1-67, gm. .001; gr. 1-6, gm. .01.

Sparteine is an alkaloid derived from Cytisus scoparius, or broom. Broom tops contain the volatile liquid alkaloid sparteine, and a crystallizable neutral principle, scoparin.

Cushny says that sparteine closely resembles cicutine in its effects, the central nervous system being but little affected by the former, which paralyzes the peripheral motor nerve ends, and probably the terminations around the cells of the sympathetic ganglia. Sparteine depresses the heart more than cicutine, making the rhythm slow and contractions weak. It increases arterial tension less than cicutine. Sparteine is very much less toxic than cicutine or gelseminine. It kills by paralyzing the ends of the phrenic nerves in the diaphragm. The diuretic action of broom is due to the scoparin.

Sparteine lowers reflex action. Shoemaker says it raises arterial tension for five hours.

Cerna found it caused a brief period of increased muscular irritability and reflex action, followed by depression; spinal convulsions, generally tetanic; first increased and then depressed the heart's force and rate; similarly increasing and later depressing the blood pressure. Death is caused by paralysis of respiration. See asserted that sparteine promptly and strongly reduced the size of the heart. He gave it for weak and irregular heart action, in doses of gr. 1-6 to 1-4 every four hours, especially in heart failure from mitral disease. In irregular heart action it proved serviceable. Gluzinski found doses under a grain best.

Shoemaker speaks well of sparteine as a cardiac tonic, in the cases where digitalin is usually administered. It has been recommended in exophthalmic goiter, tobacco heart, to prevent uremia, in angina pectoris, chorea with endocarditis, rheumatic heart diseases, the withdrawal symptoms following stoppage of morphine, as a preliminary to chloroform anesthesia in patients with weak or diseased hearts, to regulate the disturbed heart in young consumptives, etc.

There is here a curious contradiction. If sparteine can be given with advantage to the diseased hearts before chloroform anesthesia, there is hardly a doubt that it acts as a cardiac tonic. Possibly

Cushny's conclusions are based on Schmiedeberg's experiments on animals with much larger doses than are given in the cases described. The writer has given sparteine as a cardiac tonic in doses below a grain a day, and found it especially beneficial in aged persons where it is necessary to continue the remedy longer than he cared to use digitalin.

Sparteine acts as a diuretic by increasing the vascular tension in small doses, as is the case with digitalin. Scoparin is a direct and powerful diuretic, increasing the quantity of urine and the excretion of urea.

STROPHANTHIN.

Standard granule—Gr. 1-500, gm. .000125; gr. 1-134, gm. .0005.

Strophanthin is a glucoside derived from Strophanthus hispidus, and some other species of strophanthus. Several principles have been isolated from the various species of strophanthus, and the name has been applied to derivatives differing in their strength even to the ratio of one to 90. It is absolutely essential that but one of these should be employed, to obtain uniformity and safety in its use. Arnaud's strophanthin has the formula $C_{21}H_{48}O_{12}$. Fraser considers it the only active principle of the plants, looking on strophanthidin as a decomposition product. Strophanthin is a crystallizable glucoside, soluble in water and in alcohol. It is a more powerful local anesthetic than cocaine. It causes passive congestion and may cloud the cornea. It is bitter and in small doses promotes digestion. As a cardiac tonic it closely resembles digitalin, and a detailed account of its action would simply repeat what has been said at length under that head. The principal difference in their action is in the effect upon the vascular pressure, which is raised by digitalin much more than by strophanthin. In fact, the only increase in the arterial tension caused by the latter is what may be caused by the increase in the force of the heart and the consequent greater quantity of blood driven into the vessels.

Strophanthin does not disturb the digestion, nor has it any cumulative effect, that bugbear of the older physicians who did not employ the Germanic digitalin. The tonic effect is not so enduring as that of digitalin. The quieting effect on the nervous centers attributed to strophanthin is simply that seen after any cardiac tonic rightly administered.

If given continuously for some time diarrhea is apt to result.

Fraser specially recommended strophanthus in affections of the

right heart, and of the aortic valve, where digitalin is contra-indicated. Wilcox says success in its use demands a good preparation, its use in not too large or too frequent doses, avoidance of it in fully or over-compensated hearts, or in those presenting advanced muscular degeneration or mechanical defects of high degree. He considers it the drug of choice in all cases when we wish to establish compensation; all cases of arterial degeneration when more energetic cardiac contraction is required; all cardiac cases where diuresis is desired; all weak or irritable hearts; and all cases of heart disease in childhood or old age. This leaves little room for digitalin. But Balfour denies most of this, holding that when heart cases require anything beyond rest, they need a remedy to restore the elasticity of the heart muscle, and this digitalin does best.

Strophanthin has been advised in bronchial asthma, whooping-cough, hypodermically in chills of nervous character, malarial, and urethral. Uremia and dyspnea of nephritis are relieved by this remedy. It has succeeded in exophthalmic goiter, where it was given in very large doses.

If strophanthin causes cold sweating and nausea, coffee and stimulants should be given.

The dose of strophanthin should be regulated by the effect on the pulse. One of the weaker granules may be given every hour or two till the desired cardiac tonicity has been attained, and then often enough to keep up this effect. If the stronger granules are used one every four to six hours is the dose for an adult at the beginning, and this should not be exceeded until the tolerance has been ascertained.

STRYCHNINE.

Standard granules—Arsenate gr. 1-134, gm. .0005; gr. 1-67, gm. .001; gr. 1-30, gm. .002; hypophosphite gr. 1-134, gm. .0005; nitrate gr. 1-67, gm. .001; sulphate gr. 1-134, gm. .0005; gr. 1-67, gm. .001; gr. 1-30, gm. .002; valerianate gr. 1-134, gm. .0005.

Strychnine is an alkaloid derived from Strychnos nux vomica. With it is found the closely allied alkaloid, brucine. In the same group we place thebaine, calabarine, laudanine, and curarine; while several other less known alkaloids are probably to be placed here also. None of these has been studied as thoroughly as strychnine, and it is possible that each may sometime be found to fulfill some functions better than the others. Meanwhile strychnine has come into such general and extensive use that it behooves every practician to

study its actions and powers to the fullest extent, that he may be able to recognize its effects, remedial and toxic, at a moment's notice.

Physiologic and Toxic Actions.—When a toxic dose of strychnine is taken the first effect is sharpening of the special senses, with stiffness of the muscles of neck and face. The reflexes are increased, and slight irritations cause quick and powerful movements. Tremors or twitchings of the extremities occur, and are followed by general convulsions, the extensors especially being thrown into action. The head is retracted, opisthotonos appears, with the sardonic grin. Respiratory spasm causes cyanosis. The muscular spasms alternate with relaxation, when the reflex irritability is low. After two or three convulsions death occurs, the respiration not being resumed. In some cases the convulsions subside but death occurs from asphyxia. Very large doses cause death by paralysis of the nerve centers without convulsions.

The action is directed to the central nervous system. The cord is affected more than the cerebrum. The intellect is not directly affected and the pain is exquisite. Not only are the special senses made more acute but the field of vision is widened, and shades previously indistinguishable can be recognized.

The convulsions are due to stimulation of the spinal reflex function. They may be prevented by excluding external irritations. The tone of the medulla is increased by small doses, and affected by large ones as is the cord. The tendency to convulsions is lessened by rhythmic movements of any description. No direct effect is exerted on any of the voluntary muscles.

Large doses paralyze the motor nerve ends, by direct action. Small doses quicken and deepen the respirations. The heart is not directly affected by strychnine, but stimulation of the center of inhibition slightly slows it. The peripheral arterioles are contracted by stimulation of the vasoconstrictor center. Remedial doses raise the vascular pressure and slow the pulse. During convulsions the pressure rises very high, from the direct action and from the blood being forced out of the abdominal vessels by the violent contraction of the muscles. The vasoconstriction is greatest in the internal vessels, those of the skin and possibly the muscles being dilated. Cushny attributes this to stimulation of vasodilator centers in the medulla. The heart beats long after respiration ceases, and artificial respiration may keep it beating indefinitely.

Strychnine acts on the stomach as the other bitter tonics, in small doses; and is absorbed from the intestine.

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From the enormous increase of muscular activity strychnine raises correspondingly the excretion of carbonic acid and absorption of oxygen. No rise in temperature is caused, as the dissipation of heat through the skin is even more increased. The internal temperature falls a little while that of the skin rises. Even small doses cause the glycogen of the liver and muscles to disappear (Demant).

Strychnine is eliminated mainly by the kidneys, the process lasting a week or more. Part is excreted into the stomach and part oxidized in the tissues. The continued use of strychnine begets a certain degree of tolerance. Trousseau gave it in ascending doses up to and exceeding a grain a day, to adults. Man is more susceptible to it than animals, and the young are more susceptible than the old.

Strychnine stimulates the peristaltic movement of all the hollow viscera, intestines and bladder. Large doses may cause diarrhea. The pupil is dilated. Small doses promote the amylolytic action of the pancreatic juice while large doses suppress its secretion. The genital functions in both sexes, the menstrual flow, testicular secretion, erectile power and venereal appetite, are increased by strychnine.

The absorption of strychnine is more rapid when given by the rectum than by the stomach. The elimination of this drug by the saliva and other alimentary secretions tends to accumulate it in the system as it is reabsorbed from the lower bowel. Stocker found flushing of the face, throbbing head, vertigo and faintness to be the evidences of beginning toxic action, or saturation.

The slowness of its absorption and elimination renders it wise to suspend the use of strychnine for intervals. It inhibits the movements of the leucocytes, though much less than quinine. A bright red eruption is mentioned by Shoemaker as having been exceptionally caused by strychnine.

Death has resulted from half a grain of strychnine, and from three grains of extract of nux vomica; but six grains of strychnine have been taken without the fatal result. Recovery is the rule if the patient survives three hours.

Falconer reported a case of chronic poisoning, the symptoms being extreme weakness, muscular pains, stiffness of the back of the neck, clonic convulsions of the forearm with contractures of the finger flexors, vertigo, amblyopia, and weak but regular pulse. She had taken gr. 1-30 four times a day for eight months up to her death.

The diagnosis of strychnine poisoning may be made by the tonic convulsions, never clonic as in epilepsy; the jaw is not first attacked as in tetanus; in tetany other than the cervical muscles are affected with persistent rigidity; in hysteria the contractions are painless, and the history and aspect of the case are radically different; in hydrophobia the mind is affected, and the history and duration of the attack differ.

The chemical antidote to strychnine is tannic acid. Shoemaker speaks of cold tea or coffee as being available sources. The stomach should be soon washed out or vomiting induced, as the tannate of strychnine is slowly soluble. Anesthetize the convulsed patient before trying any manipulation. The chloral group are antidotes, with physostigmine and possibly pilocarpine. All relaxants are antagonistic, such as tobacco, alcohol, cicutine, morphine, glonoin, etc. Turner claimed that lard was a remedy, but this seems to be simply a means of delaying absorption.

Therapeutics.—Strychnine stands at the head of remedies for poisoning from venomous snakes, of all varieties. The effect of the venom is a paralysis of the vasoconstrictors of the abdominal organs, by which the blood from the whole body is heaped up in the abdomen, and the patient dies from cerebral anemia. This effect is directly antagonized by strychnine. It must be given in full toxic doses and repeated as required, without reference to its ordinary dosage. The discoverer urged from gr. 1-5 to 1-3 hypodermically as a first dose, and then enough to keep up the toxic rigidity secured. The failures are due to the fear or carelessness by which this dosage for effect is not persisted in until the danger is past. The paralysis keeps recurring for days perhaps, and the dosage requires intelligent, fearless and persistent repetition.

The close similarity between the symptoms of snake poison and those of the Amanita phalloides, the deadliest of poisonous mushrooms, has led to the use of strychnine similarly. This is strictly correct, and we expect similarly good results to accrue. A somewhat similar condition exists in persons overcome by enormous quantities of alcohol, as where fools bet on their ability to drink a pint or quart of whisky at a draught. The hypodermic use of enough strychnine affords the best chance of saving the life.

In doses of gr. 1-67 any of the salts of strychnine forms a good bitter tonic for weak digestions, but it is better to save this great remedy for great uses, and employ the equally efficient and far safer quassin for an appetizer. In very small doses, gr. 1-500 of the

arsenate is best, it is useful for many forms of vomiting, that of pregnancy and of drunkards especially. Give every hour till toned up enough. When alcohol has been used habitually and an effort is made to break off the habit, there is a miserable sense of debility, of utter prostration and nervelessness, mental and physical; and this is best met by strychnine in doses sufficient to put the whole system in tone like a violin string in tune. This may require but little, or enough to make the timid therapeutist, unaccustomed to dosage for effect, quake in his boots. Much or little, there is no danger of the remedy if given as really needed; and too often the treatment fails from timidity or rashness. Capsicum is the best adjuvant.

Gastric catarrh and dilatation of the stomach are relieved by small doses of strychnine continued some weeks, with carefully regulated diet. No possible benefit can accrue from any medication if the patient continues to distend his stomach with food and cold drinks, etc.

Hemorrhoids and other evidences of an atonic state of the large bowel, are relieved by moderate doses of strychnine, with suitable diet and laxatives. Chronic diarrheas and dysenteries continuing from relaxation, often respond nicely to a little strychnine.

There is no more effective or speedy heart stimulant than strychnine, which many prefer to digitalin. The doses must be carefully regulated, and large ones in fatty hearts may kill. In many cases an alternation is advisable.

In cardiac asthma there is no remedy comparable in effect to strychnine arsenate, if given to full toleration. This may require up to near a grain a day; but it is imperative that no more than actually needed be given. Sometimes it must be continued for months; but other measures, diet and regulated exertion, and climate, should be utilized so as to render the use of this priceless boon as limited as is actually necessary. For the true physician must ever distinguish between temporary improvement and actual cure; between the stimulant that rallies the last reserves, and the real increase in the vital forces.

And this last remark leads us to speak here of strychnine as a remedy for sexual weakness. It is a disaster for man or woman to get hold of this bit of information without the further knowledge that governs and corrects it. Humanity wants increased sex power, despite the notorious fact that most men and some women would be the better for having a good deal less. Strychnine cannot bring back youth, nor indeed increase the vital stock. It simply rallies the

reserves, to be used wisely by the very few, to be more quickly wasted by the foolish many.

Strychnine fills an important place in the treatment of paralyses. When an apoplectic effusion has occurred, some nerve fibers are torn asunder, others are compressed by the effused blood, by the zone of inflammation surrounding the site of injury, and by the zone of œdema surrounding that. Recovery from the compression from each goes on more slowly than in the one outside. Some fibers do not resume their functions even when the pressure is removed. Strychnine comes in here, to arouse the nerves and restore their tone. In the latter respect it is better than electricity. It should not be given till the first period is past, that when we try to limit the effusion; not in the second, when we are promoting its resorption; but after six weeks have elapsed we begin cautiously with small doses, and increase cautiously to full tolerance. And the word "cautiously" is repeated purposely.

All forms of paralysis come under this treatment. Strychnine will do all that medicine will, for these cases.

Mays has urged strychnine as the chief remedy for phthisis; and as to its efficacy, when the alimentary canal has been rendered aseptic, there is no doubt. But we have not found in it specific virtues.

Strychnine has been used with benefit in all forms of amaurosis; neuralgias of all descriptions, where full doses often break up the pain habit; chorea; epilepsy; etc.

A general tonic, one that improves the tone and increases the function of every tissue and organ in the human body, it would be strange indeed if it were not abused. We are now in the strychnine epoch, when everyone gets strychnine for everything. Many a case of strychnine habit exists, as yet unrecognized. Many a case of chronic poisoning we fear goes to the grave unrecognized. The lazy doctor adds this to his morphine and whisky, and finds he has his needs amply supplied; with an occasional dose of salts. Against this tendency the best defense is the disposition to nicety acquired through the use of the alkaloids. As one becomes accustomed to certainties in effects he needs more and more remedies by which exactness of indication may be exactly met therapeutically.

In treating the alcohol habit the nitrate of strychnine has been preferred to the other salts. It is quite soluble and easily given hypodermically.

The hypophosphite of strychnine has been advised when this

remedy is employed as a reconstructive tonic, especially in the young, and when combined with other hypophosphites, of lime, iron, quinine, etc.

Strychnine arsenate combines the properties of these two great tonics, and is most extensively employed when vital incitation is indicated. The dose as to strychnine is about two-thirds as strong as the sulphate, hence the granule of gr. 1-67 about equals gr. 1-100 of the latter.

It has seemed to the writer that the response from strychnine valerianate came more promptly than from any of the other salts. Small as is the quantity of valerianic acid in the dose, it is not without activity, and in nervous and hysteric cases, and when given as a bracer, a restorer of tone in conditions of hypochondria, neurasthenia, spermatorrhea, and the consequences of mental overwork, this salt has proved eminently satisfactory.

In all but emergencies where it is essential to obtain maximal effects as quickly as possible, it is wise to use very small doses of strychnine and gradually repeat until the desired tonicity has been secured. This avoids all danger of overdosing, of striking an idiosyncrasy, and begets in the physician the habit of closely watching his patient's symptoms, which is not so universal as one could wish. Even with alcoholics the response to strychnine may come with incredibly small doses; and on the other hand these people may require almost incredible doses to equalize the nervous pressure and restore that springlike tonicity that does so much to encourage him to persist in his reform. Many reformed inebriates emerge from the "cures" with the strychnine habit. This may be gradually shaded down into brucine, and this into berberine; but even if not, it is surely preferable to the whisky habit.

During the past decade strychnine has come generally into use as a means of sustaining the vital forces and the heart especially, during the course of fevers. In pneumonia it may be termed the chief reliance of many physicians. This matter has been fully discussed in the chapters on aconitine, digitalin and veratrine, to which the reader is referred. In all febrile maladies when there are any signs of adynamia approaching, the rule is to forestall danger by adding a sufficiency of strychnine; and many a life has been saved by this wise forethought. But that does not mean a senseless administration of this powerful drug where it is not needed. There is a place for veratrine as well as for strychnine.

In constipation strychnine is a useful ingredient of every really valuable combination for the cure of this malady.

And yet the half has not been said. Every physician of wide experience can add instances of the fitness of this most powerful agent for special conditions not mentioned in this article.

VERATRINE.

Standard granule—Gr. 1-134, gm. .0005.

Of the veratrine group veratrum viride has won the strongest hold upon the medical profession, whose confidence in it has not been shaken by adverse reports, the introduction of German synthetic antipyretics, or even the dreadful accusations of "eclecticism" and "homeopathy." The alkaloidal representative of the green veratrum is generally assumed to be veratrine. We propose to examine this question and ascertain whether this substance really represents veratrum viride therapeutically; and if not, whether either of the other bodies extracted from this group of plants more nearly represents the desirable qualities. For the galenic preparations of veratrum viride are no exceptions to the rule, that all plant-extracts, tinctures, etc., contain their active principles in uncertain and variable quantities and proportions, and hence are fatally wanting in the scientific precision of their application for the cure of the sick.

Veratrum viride contains a little veratrine, pseudojervine, cevadine and veratralbine, with a good deal of jervine, and rubijervine or veratroidine. To the latter two its effects are mainly attributable.

Cevadilla contains veratrine, sabadine, cevadilline, sabadinine and Wright's veratrine. Of these veratrine alone has been studied carefully. The others have not as yet been shown to possess any other importance than as weakening the official veratrine by their presence in variable proportions.

Merck lists: 1. C. P. crystallized veratrine or cevadine (soluble in alcohol and ether); 2, Veratrine, U. S. P., containing the other cevadilla alkaloids but in too small proportion to affect the dosage; 3, Veratrine amorphous; 4, V. acetate, hydrochlorate, nitrate, sulphate and valerianate; 5, Jervine; 6, Sabadilline, C_{21} H_{27} NO_7, soluble in alcohol, chloroform and benzole, and in 143 parts boiling water; dose twelve times that of veratrine (Urpav); 7, Sabadilline sulphate, soluble in water or alcohol; 8, Sabadine,

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$C_{29}H_{51}NO_8$, soluble in water, alcohol or ether, also its salts; 9, Sabadinine, $C_{27}H_{45}NO_8$, soluble in water, alcohol, ether or chloroform; also the hydrochlorate, bisulphate and an amorphous form.

Physiologic Action.—Veratrine, $C_{32}H_{49}NO_9$ ($C_{37}H_{53}NO_{11}$, Bruehl), is quite soluble in hot water and alcohol, slightly in cold water. It is absorbed from the skin, the mucous membranes and the subcutaneous tissues. It is rapidly eliminated by the kidneys, and also by the gastrointestinal mucous membrane, the latter being irritated by its passage. When inhaled, veratrine causes dry, irritative and fatiguing cough. Applied to the nasal mucosa it causes violent and prolonged sneezing. Even a granule containing half a milligram, allowed to dissolve in a child's mouth, has raised vesicles. Applied to the unbroken skin, veratrine does not cause redness, but a sensation of burning and prickling, followed by cold and formication, with anesthesia.

Given in moderate doses by the mouth, veratrine increases the excretion of urine, perspiration and saliva, and if continued or increased causes a sense of warmth in the stomach, with burning, nausea, colic, vomiting and diarrhea. Persons unusually susceptible to its action have bloody stools and vomit. The prickling extends over the entire skin, followed by anesthesia and free sweating. Van Renterghem took 0.0005 every half-hour, for 36 hours, without experiencing diarrhea, vomiting or any toxic symptom.

Toxic doses cause dilatation of the pupils.

Veratrine exercises a deleterious effect upon certain protoplasms, in which it resembles quinine (Kuen and Scharrenbroich). The lymphatics are thereby rendered less hospitable to microbes; or perhaps the latter are attacked by the veratrine (Van Renterghem).

Absorbed through the skin, veratrine may cause diuresis instead of purging (Bardsley).

Small doses quicken the pulse and respiration and raise the blood-pressure, but larger or repeated doses reverse all these.

The temperature is lowered from the start.

At first the vasomotor centers, the peripheral inhibitory nerves and medullary centers are stimulated, later they are paralyzed (Hare).

Toxic doses cause continued weakening of the heart and respiration, which finally cease almost simultaneously. The pulse becomes slow and irregular, breathing slow and labored. Fibrillary contractions of the muscles are frequent, with convulsions, followed by collaspe, unconsciousness and death by respiratory failure (Cushny).

The nausea may in part be due to direct irritation of the gastric sensory nerve-ends, but is probably due in the main to central irritation. The salivation may be primary, or due to the nausea. The purging is attributable to action on the intestinal nerves; perspiration to stimulation of the nerve-ends regulating secretion of the sudoriparous glands (Cushny).

The most marked peculiarity of the action of veratrine, is its effect upon the striated muscular fiber. The contractions are strengthened and continuous, relaxation being so slow that coördination is impaired. The relaxation occupies 20 to 30 times the normal period. If the muscle has been fatigued, veratrine causes marked improvement in its contractions. This effect of veratrine is in turn removed by fatigue, or by severe cold or heat; while moderate heat increases or prolongs the effect of the drug (Cushny). Thus, the febrile temperature alters the action of veratrine (Brunton). The heat generated by exercise is increased by veratrine. Both the irritability and the absolute strength of the muscles are increased by veratrine. In the frog, the muscle is finally paralyzed, but in man the respiratory failure occurs long before this is due. This action is peripheric, as it occurs in muscles that have been excised. It is attributed to an increase in the katabolism in the muscular cells (Cushny).

Applied directly to the peripheral nerves, their irritability is abolished (Waller).

The ventricular muscular apparatus in frogs is affected like the striated muscles, but the auricular fibers much less. The ventricular systole is at first strengthened and prolonged, then the period of contraction is lengthened until one ventricular rhythm corresponds to two of the auricle. Later the contractions become slower and weaker until they cease. In this the action is analogous to that of digitalis. Stimulation of the cardiac inhibitory center slows the heart, lessening its output, the peripheral vessels contracting through central vasomotor stimulation. With larger doses the vagus-ends are paralyzed, its center depressed, the pulse is faster, the tension lowered. No prolongation of the systole is seen, but a slight stimulation, since maximum doses quicken the rhythm even after atropine. Veratrine resembles aconitine as to the circulation, but without stimulating the cardiac muscle (Cushny). The heart stops in diastole (Hare).

Respiration: The action closely resembles that of aconitine, death being by both caused by respiratory paralysis (Cushny).

Central Nervous System: Stimulated as by aconitine, large doses ending in paralysis. The medulla and cord are more affected than the cerebrum, consciousness ending only in death.

Temperature: Lowered by slowing of circulation, unless convulsions are marked, when the temperature is raised.

Veratrine increases reflex excitability (Brunton).

The convulsions of veratrine are always tonic, never clonic or epileptoid. Tetanic spasms are excited by the slightest touch or breath of air (Hare).

Veratrine lessens oxidation somewhat (Brunton).

The peculiar prickling caused by veratrine is felt in the fingers, toes and joints; that of aconitine in the tongue (Brunton). It stimulates the nerves of ordinary sensation and the pulmonary branches of the vagus; the slow pulse caused by it being lessened or abolished by section of the vagi. Stimulation of the vasomotor center is shown by the rise of blood-pressure, ceasing on section of the cord below the medulla; though subsidiary centers exist in the cord itself. Small doses stimulate the cardiac muscle, causing increased energy of contraction, the pulse remaining the same or slower. Larger doses induce a following stage of peristaltic action, and stoppage in either systole or diastole (Brunton).

The effect of veratrine is weakened when it is passed through the liver (Sollmann).

In chronic poisoning the patient becomes weak and thin, with bloody diarrhea, insomnia and delirium (Sollmann).

OTHER VERATRUM ALKALOIDS.

Jervine is soluble in alcohol only. It causes sluggishness, progressive muscular weakness and lessened reflexes, violent general tremors, ending in convulsions, with violent motion but loss of power; not tetanic, paralysis rapidly supervening; pupils unaffected, no purging or vomiting, profuse salivation, no local irritation, consciousness continues to the last, death from asphyxia.

The convulsions are cerebral and due to disturbed cerebral circulation. The loss of muscular power is due to spinal depression; the peripheral nerves and muscles are unaffected. It is a direct depressant of the respiratory centers and of the circulation. The pulse at first is slowed; later is faster. The blood-pressure falls from first to last. The action is not affected by vagus section. Direct depression of heart-muscle or its ganglia is caused by any dose. It depresses the vasomotor centers.

Summary: A powerful depressant of the heart and vasomotor centers, also of the motor spinal and respiratory centers, with little other effect on the body (Wood).

Veratroidine or rubijervine is more irritant than jervine. It usually causes vomiting, sometimes purging, before a fatal dose is absorbed. It does not cause such severe convulsions. Death occurs from paralysis of the respiratory center. It resembles jervine in action on the cerebrum, cord, peripheral nerves and muscles. The circulatory effect is subordinate to that on the respiration. Toxic doses cause an enormous rise in arterial pressure. After section of the vagi, it could not slow the pulse. After intoxication with it, division of the vagi caused enormous rapidity of the pulse. It stimulates cardiac inhibition powerfully, like aconitine. The vasomotor centers are unaffected.

Summary: A powerful respiratory poison, at first slowing the pulse-rate by stimulating the pneumogastrics, but soon losing control of the heart in powerful respiratory paralysis. "The action of veratrum viride is the result of the combined influence of its alkaloids, and as the relative proportions of these differ in different rhizomes, so in the finer details of its physiologic action one specimen of the veratrum viride differs from another" (Wood).

Protoveratrine, $C_{32}H_{51}NO_{11}$, is the principal alkaloid of veratrum album, the others being jervine, rubijervine, pseudojervine and protoveratridine. Locally it causes less sensory irritation than veratrine, and the anesthesia following is more complete. It does not paralyze the motor nerve-ends in maximum doses. It shortens the muscle-contractions, which are higher, the absolute strength increased, but fatigue follows more quickly than when the drug is not used. It is much more toxic than veratrine, approaching aconitine in strength, while standing between it and veratrine in action. With the rubijervine, it renders white hellebore more irritant to the stomach and bowels than either cevadilla or green hellebore; but this is not uniform, as some cases of poisoning were not marked by severe gastrointestinal action.

Therapeutics.—Both Schmiedeberg and Liebermeister condemn the internal use of veratrine; but Van Renterghem says: "One should not forget that the rise of arterial pressure and the great loss of heat by the skin occasioned by fever, mean something; for this increase of intravascular tension does not necessarily imply an increased oxidation in the tissues, as has been claimed. But it is certain that the state of depression of the circulatory functions oc-

casioned by fever adds a very serious factor to the other causes of fever heat; and that veratrine, prudently administered, suppresses this state and with it its consequences. We possess in our arsenal no medicament as powerful, as sure, as manageable to combat fever, especially acute rheumatism and croupous pneumonia."

We have in this pregnant sentence the key to the uses of veratrine in febrile conditions. "It is especially in acute maladies that its action is powerful. Since its introduction in our hospital practice, there has been no fever or inflammation that we could not direct to resolution" (Burggræve). "We have always succeeded, grace to it, in producing defervescence, in lowering the most intense fever, in conjuring an imminent inflammation, restraining its development, or mitigating its effects. It has served us with equal success in typhoid fever, puerperal fever, pneumonia, the exanthemata, etc." (Van Renterghem).

A second indication for veratrine is found in its power of causing sedation of the cutaneous sensory nerves. Burggræve called it "the refresher of the skin," and advised it in erythema, erysipelas, zoster, pemphigus, eczema, ecthyma, urticaria, phlyctenular herpes, febrile aphthæ, boils, carbuncles and malignant pustule; in the latter with the cautery and other indicated remedies. Van Renterghem obtained success from veratrine in pruritic maladies generally. The sedative action of veratrine upon the nervous system renders it suitable in treating neuralgias, the violent pains of rheumatismal ophthalmia, and sciatica. The success following its use in alcoholic tremor, typhoid convalescence, multiple sclerosis (Feris), chorea (d'Oliveiro, etc.), and tetanus (Harris), may be explained by the action of veratrine on striated muscular fiber. Turnbull and Gintrac gave it in cardiac affections, arthritic and rheumatismal, and for palpitation.

In eclampsia veratrine may well replace the tincture of veratrum viride, which is the most trusted remedy of the profession in this dangerous malady.

Externally veratrine is employed in the form of an ointment, applied over the course of diseased nerves, with the object of producing analgesia; in various neuralgias, facial, lumbar, spinal and coccygeal.

The dose for internal administration is given as 0.0015 to 0.005 (gr. 1-45—1-12) three times daily, and 0.02 (gr. ⅓) *per diem*. It is little wonder that with such dosage this inestimable remedy has fallen into disuse, and gained the repute of a dangerous weapon.

Many persons may be found who cannot take the smallest of the doses named, without unpleasant effects. Except in eclampsia, the dose of 0.0005 (gr. 1-134) should never be exceeded; and this if given every quarter to one hour until the desired effect has been secured, will amply meet every requirement. In every sthenic febrile attack let the bowels be emptied and the alimentary canal rendered aseptic; then administer veratrine, 0.0005, alone or with digitalin and aconitine, or whatever else is indicated. The speedy solubility of veratrine, its rapid elimination, and its power of unlocking every channel of elimination from the body, even when closed by disease that renders ordinary medication perilous, places this remedy in advance of every other. In cirrhotic kidney, when ⅛ grain of morphine or one grain of calomel may cause death, veratrine not only provides for its own elimination but renders the administration of other remedies safe. In eclampsia alone should the dose be exceeded. Here the local irritation following the hypodermic application of veratrine must be disregarded, and 0.005 (gr. 1-12) given at once, in diluted alcohol, to powerfully stimulate elimination, and save the brain from the imminent peril threatening it. In other forms of uremia, in diabetic and icteric coma, the same administration should be employed, with due watchfulness. True, the heart's force must be kept up, but that matters little if the brain is overwhelmed by toxins. Veratrine and the normal saline solution meet the need better than any other known remedies.

Given internally in the doses recommended (0.0005 every quarter to one hour), veratrine should be continued until the first faint intimation of nausea is manifested; then withheld until this has disappeared, or until again indicated by the symptoms. If the stomach develops an idiosyncrasy against veratrine, codeine, 0.005, may be administered with a few doses, provided the pulse and fever show the antipyretic is still needed. When one has utilized veratrine, in this strictly scientific method of administration, for several years, and become thoroughly familiar with its properties, its tremendous power, its safety, its perfect manageableness, he can only hear with amazement the condemnation of this alkaloid by men who have good repute as therapeutists.

Externally an ointment of veratrine, 0.2—0.5 to 25 grams of any desired base, may be employed.

Synergists.—Aconitine as a defervescent, antiphlogistic and antineuralgic. Cicutine, curarine and digitalin, as to the action on striated muscle fiber, on the motor nerve-ends and on the heart-

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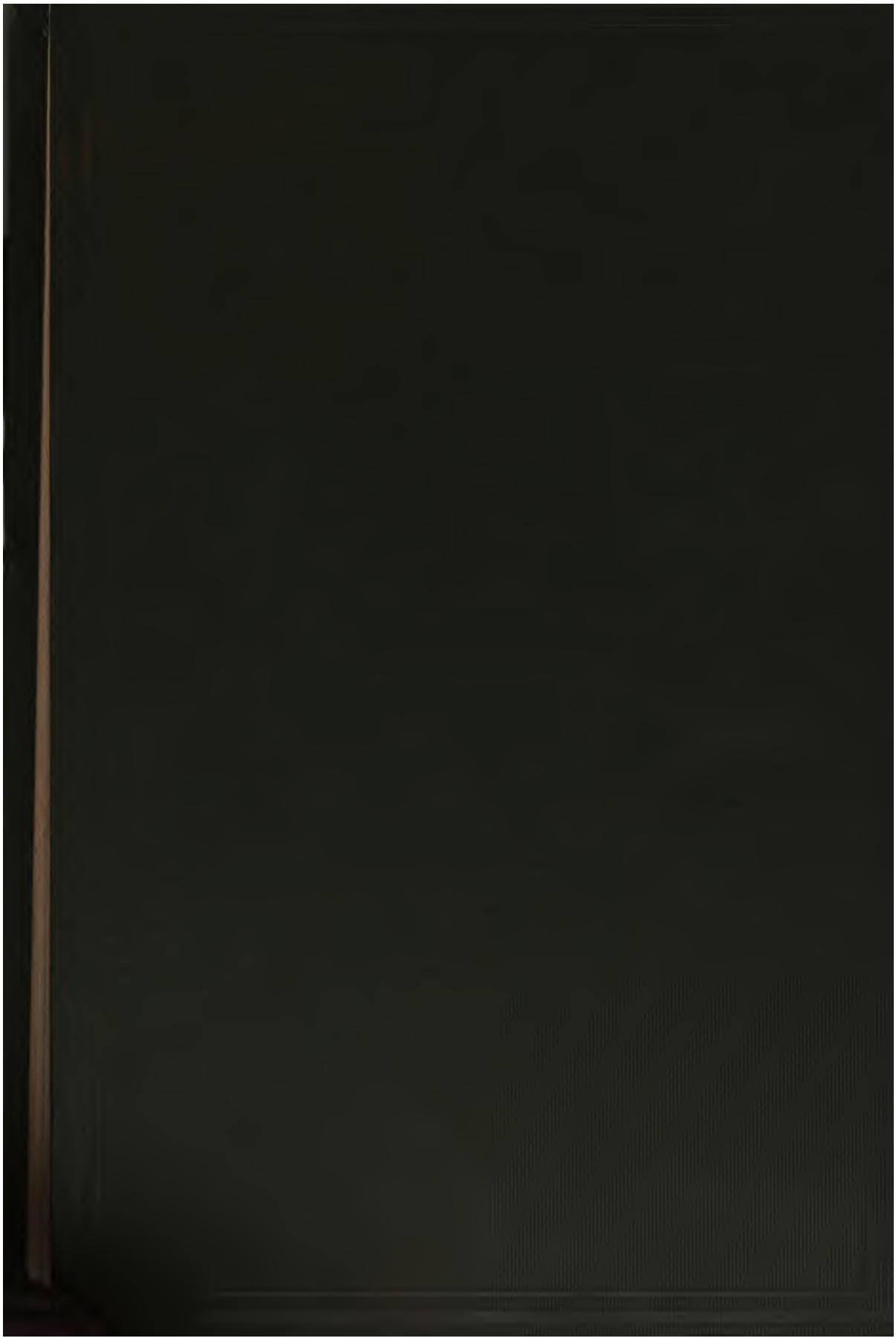
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